Atlantic Association for Research in the Mathematical Sciences

Research - Outreach - Community

Newsletter

Autumn 2015

Games@Dal 2015

Nineteen people, including 4 students, attended the Workshop who came from Belgium, Canada, France, Israel, Portugal, Scotland, Sweden, and USA. The first day of the Workshop consisted of talks:

1) Alda Carvalho, C. Santos, (Portugal): Oak, ordinal sums and the generalized mex function;

2) A. Fraenkel, Lior Goldberg (Israel): Extensions of the results of Duchene, Fraenkel, Nowakowski and Rigo, Extensions and restrictions of "Wythoff's game preserving its P-positions" to Generalized Wythoff ($|k-\ell| < t$, $t >$ a fixed integer);

3) Neil McKay (Canada): Sums of Hackenbush Stalks;

4) Gabriel Renault (Belgium): Invertibility modulo dead-ending no-P-universes;

5) Simon Rubinstein-Salzedo (USA): Multi-pile Fibonacci nim;

6) Craig Tennenhouse (USA): New Bogus Nim variants.

This was followed by three days of intensive work. In particular, four problems caught the attention of subgroups. People wandered between subgroups and joined in the conversations. The names reflect the main people in the discussions.

1: Subversion: is a game with self-referential rules that also is an instance of a game where, at each stage, at most one player has a non-terminal option. The canonical forms can be complicated but it was discovered that the Atomic Weights are restricted to being integral, -1/2, 1/2, and a switch of the form { -2 | x } or { x | 2 }. The conjecture is that if the game has finite nim-dimension then the Atomic Weights will also be restricted. A paper is now in preparation.

2: Complexity of Placement Games: A placement game has players placing pieces which then cannot be moved or removed from the board. Although not solved in general, the case for "Distance Games", for example COL and SNORT, was solved. A paper is now in preparation.

3: Many variants of Leapfrog: these arose out of a question raised by Richard K. Guy. Intriguing conjectures were obtained but no definitive progress as of yet.

4: Blocking Games: add to any ruleset the option for the previous player to forbid a particular option on the next turn. This led to an ongoing discussion of cellular automata generated by combinatorial games.

East Coast Combinatorics Conference

The East Coast Combinatorics Conference (ECCC) was held July 27-28th at Mount Allison University. The ECCC is designed to bring together mathematicians and computer scientists interested in all aspects of combinatorics and the scope of the conference includes most areas of modern combinatorics, including but not limited to, graph theory, design theory, combinatorial optimization, and applications of combinatorics in computer science. This was the 10th year of the conference.

The plenary speaker was Dr. Peter Danziger (Ryerson University), a well-respected researcher in both design theory and graph theory. He gave a fascinating talk, entitled "Factoring into cycles", which focussed on the Oberwolfach and Hamilton-Waterloo problems; the talk included the origins and history of the problems as well as recent results. Additionally, there were 11 contributed talks over two days on a wide variety of combinatorial topics and an hour-long "open problems" session. A number of open problems were presented by participants in a very collaborative and inclusive atmosphere. Along with the "open problems" session, the conference talks generated interesting discussions and new ideas; and also allowed researchers with existing collaborative projects an opportunity to come together to work on such projects. The conference was made possible through generous funding from the Atlantic Association for Research in the Mathematical Sciences (AARMS) and funding from the Mount Allison Dean of Science.

Immediately following the ECCC, the Graphs-and-Games Group (AARMS Collaborative Research Group) held a mini-workshop (July 29th). Most ECCC participants remained a third day and participated in this mini-workshop. The mini-workshop provided a forum for undergraduate students to give short talks on their summer research, but the majority of the day was devoted to exploring new research problems in a collaborative atmosphere. At the end of the day, participants regrouped to report of their progress or frustrations. Some of the groups formed at the mini-workshop have since continued to work on these research problems.

News

International Symposium in Statistics

The International Symposium in Statistics (ISS) 2015 was hosted by the Department of Mathematics and Statistics of Memorial University at the Holiday Inn, St. John's, from July 6 to 8, 2015. This meeting covering five specialized research themes: Multi-dimensional data analysis in continuous setup; Multivariate analysis for longitudinal categorical data; Time series with financial and environmental applications; Spatial-temporal data analysis; and Familial longitudinal data analysis in semi-parametric setup, was attended by 46 delegates from many countries such as Brazil, France, India, Switzerland, USA and Canada, covering a large part of the globe. The meeting was a grand success with an excellent academic program complemented by two social events: the symposium banquet and a whale and puffin watching tour.

The symposium welcome address was given by Dr. Charmaine Dean, former President of the SSC (Statistical Society of Canada) and the current Dean of Science of the University of Western Ontario. Dr. Alwell Oyet, Deputy Head, welcomed the delegates on behalf of the host department. Dr. Brajendra Sutradhar, General Chair of the symposium welcomed all guests and provided a brief history of the past two symposiums (ISS-2009, ISS-2012) and their connection to the present symposium (ISS-2015). He thanked all sponsors, in particular to Memorial University, CANSSI (Canadian Statistical Sciences Institute), and AARMS for their support in organizing this meeting.

There were four key note speeches in four different areas given by three speakers. Professor Anthony C. Davison from EPFL, Switzerland gave his key note address on Max-stable processes on river networks, under the theme of spatial-temporal data analysis. Professor Brajendra C. Sutradhar from Memorial University, Canada gave part 1 of his key note presentation on Advances and challenges in correlated data analysis in non-Gaussian multivariate setup; and part 2 of the presentation on Advances and challenges in analyzing ordinal categorical data in semi-parametric setup. The 3rd key note address was given by Professor Andrew Harvey from Cambridge University, UK., on New developments in modeling dynamic volatility. Nine special invited talks over three days of the symposium were given by professors Paul D. Sampson, University of Washington; Grace Y. Yi, University of Waterloo; Nairanjana Dasgupta, Washington State University; Roman Viveros-Aguilera, McMaster University; Julio M. Singer, Universidade de Sao Paulo; David E. Tyler, Rutgers- The State University of New Jersy; Refiq Soyer, The George Washington University, Charmaine Dean, The University of Western Ontario; and Richard J. Cook, University of Waterloo.

participants at ISS 2015 in St. John's

The symposium had another two invited speakers, Drs. Alwell Oyet from Memorial University, and Ashis SenGupta from Indian Statistical Institute. Also contributed papers were presented by seven speakers including four graduate students. It is planned that a selected number of papers presented in the symposium will be published in the near future as lecture notes in the Springer's lecture note series.

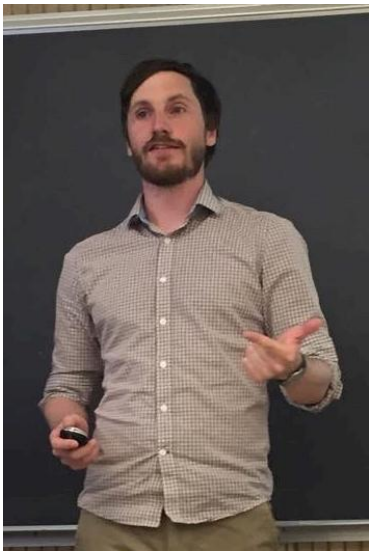
- Brajendra C. Sutradhar

Selected Areas in Cryptography

participants at SAC in Sackville

The 22nd Conference on Selected Areas in Cryptography (SAC) was hosted at Mount Allison University from August 12-14, 2015. SAC, which is the premier Canadian cryptography conference, drew approximately 55 attendees, many of them international. In addition, this year SAC was preceded by the 1st SAC Summer School (S3) (August 10-12), which was designed to expose students and other early researchers to in-depth knowledge of specific areas of cryptography through extended presentations by world-class specialists. The inaugural SAC Summer School drew 30 attendees, and the presenters included Paul Syverson of the US Naval Research Laboratory, a co-creator of onion routing and the Tor anonymity system, the latter of which is used by political dissidents and whistleblowers worldwide. S3 and SAC were co-chaired by Orr Dunkelman of the University of Haifa, Israel, and Liam Keliher of Mount Allison University. The co-chairs are grateful to the organizations that generously supported both S3 and SAC, including AARMS, Microsoft Research, the International Association for Cryptologic Research (IACR), Mount Allison University, and the New Brunswick branch of the IEEE.

Meet AARMS Postdoc Chris Duffy



Hello! I am the new AARMS outreach post-doctoral fellow. I will halve my time between supporting AARMS outreach initiatives and conducting research. This is the first year that this fellowship has existed, and so the tasks and duties associated with outreach portion of the position are a learning process for everyone. In addition to providing administrative and day-of support of outreach events, I will be working toward building a bank of resources, presentations and materials. Hopefully, this collection will facilitate the spread of the many successful outreach events and programs in the Atlantic region.

In August 2015 I completed a joint Ph.D. at the Universities of Victoria and Bordeaux. Splitting my time between Victoria and Bordeaux gave me a chance to work with researchers on either sides of the Atlantic who are experts in various aspects of graph homomorphism and colouring. Though doing a joint Ph.D presented a variety of administrative difficulties, (e.g. by which university's regulations is the defence held?), it was valuable experience in research, university procedure, and filling in paperwork.

My dissertation focussed a variety of colouring parameters for both oriented graphs and 2-edge coloured graphs, as well as on a generalisation that allows these two types of graphs and ordinary graphs to be brought under the same framework with respect to colouring and homomorphism. This area is full of surprising results and fertile with open problems and conjectures of all levels of difficulty. For example, the four-colour theorem for planar graphs becomes the eighty-colour theorem when examined for orientations of planar graphs. Despite years of effort by many talented researchers, it is not known if eighty is best possible, or even if there is an oriented planar graph that requires more than twenty colours in an oriented colouring.

At Dalhousie, I will be working with Jeannette Janessen on problems in graphs and games, including a version of the prisoners dilemma played on graphs. During my master's degree I worked on the Firefighter problem, and am looking forward to working again on games and discrete-time processes on graphs.

I am excited to be involved in the various outreach initiatives in the Atlantic provinces. My hope is that in my time in this position I will not only be exposed to some excellent researchers and research, but also get to continue to participate in the joy that is making mathematics accessible and enjoyable to younger students.

- Chris Duffy

International Workshop in Algebraic Groups and Lie Algebras

The International Workshop "Algebraic Groups and Lie Algebras" was the second international workshop jointly organized by the Atlantic Algebra Centre (AAC) and the Network of Ontario Lie Theorists (NOLT). The first one, "Enveloping Algebras and Representation Theory" was held in 2014 at Memorial University. Members of both AAC and NOLT also took an active part in the workshop "From Lie Algebras to Group Schemes" held at the University of Ottawa and Carleton University this May.

Algebraic groups is one of the cornerstones of modern mathematics. They are closely related to Lie groups and combine methods of Algebra, Algebraic Geometry, Topology, Functional Analysis, Lie Theory and other areas. Because of the richness of the subject, Algebraic groups find extensive applications in mathematics and natural sciences. It is sufficient to mention applications in Cryptography, Harmonic Analysis, Algebraic Topology, conservation laws in Physics, symmetries of molecules in Chemistry, etc. One of the main tools in the theory of algebraic groups is the theory of Lie algebras. And, conversely, algebraic groups often serve as an important tool in the study of Lie algebras. This is why researchers usually study both subjects at the same time, which turns out to be very effective. There are hundreds of mathematicians in the world working in these areas. The theory has become very deep and has many specialized branches and many applications. In our workshop, we focused on the following areas: actions of algebraic groups by automorphisms of algebraic varieties, graded algebras and superalgebras, linear representations of groups and Lie algebras, and applications of algebraic groups to the structure theory of algebras including positive characteristic. Most of these areas are actively studied by the members of AAC and NOLT.

The workshop was held at the Bonne Bay Marine Station on the West Coast of Newfoundland. The Organizing Committee consisted of Yuri Bahturin and Mikhail Kochetov (AAC) and Kirill Zynullin (NOLT). The workshop was funded by AARMS, Fields and Memorial. There were 24 participants from eight countries: Brazil, Canada, Russia, Slovenia, Spain, Sweden, UK, and USA. The invited speakers were:

- Ivan Arzhantsev (Moscow State University, Russia)
- Cristina Draper (University of Malaga, Spain)
- Stefan Gille (University of Alberta)
- Nikita Karpenko (University of Alberta)
- Erhard Neher (University of Ottawa)
- Victor Petrogradsky (University of Brasilia, Brazil)
- Alexander Premet (University of Manchester, UK)

In addition, one-hour research talks were given by Seidon Alsaody (University of Uppsala, Sweden), Janez Bernik (University of Ljubljana, Slovenia), Mitja Mastnak (Saint Mary's University), and Yorck Sommerhäuser (Memorial University). Several short communications were given by graduate students and postdoctoral fellows. August 19 was devoted to informal discussions and a tour of Gros Morne National Park.

The IFIP Working Group 2.5 on Numerical Software meeting and Bluenose Applied and Computational Mathematics Days

The IFIP Working Group 2.5 on Numerical Software meeting was held at Saint Mary's University July 9-10, 2015. The associated Bluenose Applied and Computational Math Days workshop was also hosted at Saint Mary's on July 11-12.

IFIP was established under the auspices of UNESCO in 1960 to promote international cooperation in the field of information processing. IFIP does its work through a collection of 13 Technical Committees (TCs) and some 100 working groups. Working Group 2.5 on Numerical Software (WG 2.5), which is part of TC2 on Software Theory and Practice, works to improve the quality of scientific computation by promoting the development and availability of sound numerical software. WG 2.5 members come from all over the world and are elected both in recognition of the substantial contributions that they have already made to the field, but also for their commitment to actively participate in WG 2.5 projects. There are currently about 30 active members, along with a similar number of affiliated members.

WG 2.5 members take turns hosting the yearly meeting at their home institutions. At these meetings, members discuss the latest developments associated with topics that the group has decided to formally track, as well as crafting plans for joint projects. In addition, each WG 2.5 meeting is paired with a local workshop to foster exchange of information between the Working Group and local students and researchers with an interest in the design and effective use of numerical software. These workshops provide an excellent opportunity for local researchers involved in numerical analysis scientific computing to meet experts who are developing and implementing useful and reliable software tools that can be applied in a variety of application areas. As well, the members of the Working Group get a chance to find out about projects that are being undertaken by researchers who are local to the area where the WG 2.5 meeting is held. In recent years these meetings have been held in Toronto, Canada, Raleigh, USA, Leuven, Belgium, Boulder, USA, Santander, Spain, Shanghai, China, and Vienna, Austria.

The 2015 Bluenose Applied and Computation Math meeting represented the 12th such meeting in this series. The first meeting was held at Acadia University in 2000. Subsequent meetings have been held, in 2001 at Saint Mary's University, in 2002 at Dalhousie University, in 2003 at Saint Mary's University, in 2004 at Acadia University, in 2005 at Cape Breton University, in 2006 at St. Francis Xavier University, in 2007 at Saint Mary's University, in 2008 at Dalhousie University, in 2009 at Acadia University, and in 2011 at Saint Mary's University.

Participants have typically included a mix of researchers in application domains and researchers who specialize in numerical analysis and scientific computing, as well as students who are working with these researchers. Participants typically come from academia but over the years there have also been speakers from industry and government labs. As well, there have often been talks by students: typically graduate students or post-docs but occasionally undergraduate research students. All past meetings have been one day in length and have usually featured mostly regional participation, with participation from at most one or two speakers from outside the region.

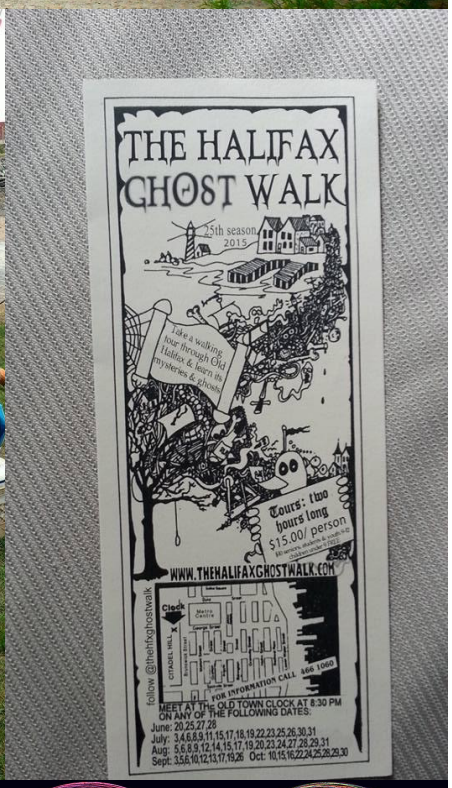
There was one regional participant in this year's WG 2.5 meeting; the remainder of the participants were from a number of countries from around the world. There were also two participants who participated by Skype – a first for the working group. (IFIP Participants: 2 from Canada, 5 from the US, 1 from Sweden, 1 from New Zealand, 1 from Belgium).

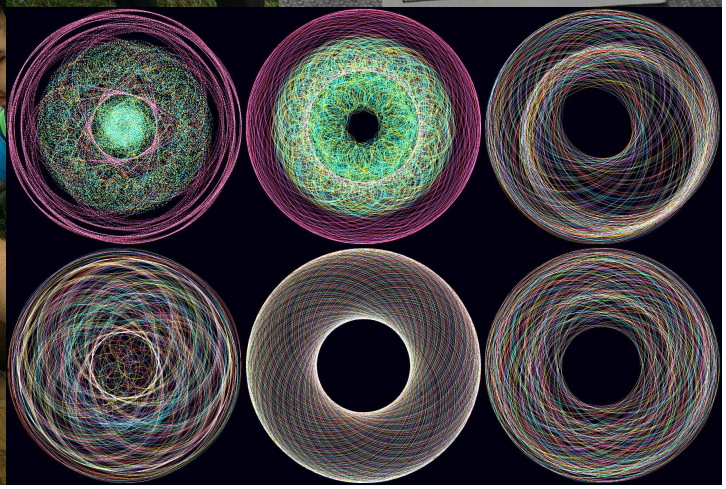
For the Bluenose workshop, as in the past, there were a number of participants (faculty and students) from the Atlantic region. However, since the workshop took place immediately after the Working Group meeting, we also drew a number of the members of the IFIP Working Group to the Bluenose workshop. Furthermore, because the workshop took place on a weekend during the AARMS Summer School, we had the participation of all the summer school instructors and many of the summer school students attended the workshop. There were 6 faculty participants from the Atlantic region and 12 faculty participants from outside the region (Canada, US, Norway, Sweden, India, New Zealand, UK). There were 4 student participants from the Atlantic region and 26 from elsewhere (Canada, US, Saudi Arabia, China, India, Italy).

A number of the faculty participants gave talks. All the summer school instructors give talks (5); there were 3 talks by IFIP members, and 4 talks by regional faculty. In order to allow active participation by students, we hosted a poster session that ran throughout the workshop, allowing students a forum in which to present their research. This was a first for the Bluenose workshop series. Eight students gave posters. Two of the poster presenters were from the region; the rest were from outside (summer school students). The program for the workshop consisted of 12 speakers and 8 student poster presentations, with additional participation from faculty and students who did not present, for a total of about 36 participants. The end of the first day featured a reception where participants had the opportunity to network.

At the Bluenose Workshop in Halifax

Photos from the 2016 Summer School at Dalhousie





Recent and Upcoming Events

Domain Decomposition Methods for the Parallel Solution of Partial Differential Equations
Organizers: Ronald Haynes, David Iron, Hermann Brunner, Paul Muir
Location: Dalhousie University, Halifax
Date: August 4-9, 2015
Contact Information: Ronald Haynes

Conference on Selected Areas in Cryptography (SAC 2015) + SAC Summer School (S3)
Organizers: Liam Keliher and Orr Dunkelman
Location: Mount Allison University, Sackville
Date: August 10-14, 2015
Contact Information: Liam Keliher

Games at Dal VIII
Organizers: Urban Larsson and Richard Nowakowski
Location: Dalhousie University, Halifax
Date: August 11-14, 2015
Contact Information: Richard Nowakowski

Algebraic Groups and Lie Algebras
Organizers: Mikhail Kotchetov, Kirill Zainoulline and Yuri Bahturin
Location: Bonne Bay Marine Station of MUN, NL
Date: August 16-22, 2015
Contact Information: Mikhail Kotchetov

AHA 2015
Organizers: Keith Taylor et al
Location: Dalhousie University, Halifax
Date: August 17-21, 2015
Contact Information: Keith Taylor

Atlantic Universities Math Stats and CS Conference 2015
Organizers: Daniel Silver et al
Location: Acadia University, Wolfville
Date: October 23-24, 2015
Contact Information: Daniel Silver

Combinatorial Algebra meets Algebraic Combinatorics
Organizers: Sara Faridi, Colin Ingalls, Hugh Thomas
Location: Western University, London, ON
Date: January 22-24, 2016
Contact Information: Hugh Thomas

MBI Summer School on Mathematical Epidemiology
Organizers: James Watmough et al
Location: Mathematical Biosciences Institute, Columbus, Ohio
Date: May 12-24, 2016
Contact Information: James Watmough

Workshop on Homotopy Type Theory
Organizers: Dan Christensen et al
Location: Fields Institute, Toronto
Date: May 16-20, 2016
Contact Information: Dan Christensen

AARMS is proud to sponsor high-quality activities in Atlantic Canada which significantly enhance research and the training of graduate students.

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"Mathematics is a game played according to certain simple rules with meaningless marks on paper." - *David Hilbert*