Submittee: Peggy Jankovic
Date Submitted: 2015-07-27 10:36
Title: Canadian Undergraduate Mathematics Conference
Event Type: Conference-Workshop

Location:
University of Alberta, Edmonton, Alberta

Dates:
June 17th-21st, 2015

Topic:
Undergraduate Mathematics and Statistics

Methodology:
Since its founding in 1994, the Canadian Undergraduate Mathematics Conference has been a celebration of undergraduate mathematics. The bulk of the conference constitutes student talks, but also includes keynote talks, social excursions, our roundtable discussions on topics related to mathematics, and an evening devoted to discussing gender diversity in mathematics.

Objectives Achieved:
Our main objectives were to offer engaging keynote speakers and to optimally schedule student talks. The point of the CUMC is the students that attend. Scheduling talks so that attendees can attend as many as possible was our main objective, and this was very successfully achieved at the 2015 CUMC. By eliminating 40 minute talks and spreading out talk time a little bit more, we were able to schedule an average of three talks per block, which meant students could attend a third of the total talks! This is much higher than it has been in the past. In terms of keynotes, our speakers covered not only a wide range of mathematical topics, but they were also each engaging, generating lots of good discussion and questions after each keynote lecture.

Scientific Highlights:
The majority of CUMCs have been held in central or eastern Canada. This iteration of the CUMC, hosted at the University of Alberta, brought increased attention to the universities in western Canada. As is evident by the bids for the 2016 CUMC, western universities are stepping up and taking a bigger part in the Canadian undergraduate mathematics community. On a more individual level, each student made their own new connections at the conference and found new ideas and resources through others' talks. A number of students also had the opportunity to explore grad studies at the University of Alberta, hence increasing awareness of grad studies at a PIMS university in senior Canadian undergraduate students.

Organizers:

McDonald, Emma, Department of Mathematical and Statistical Sciences, University of Alberta //
Jankovic, Peggy, Department of Mathematical and Statistical Sciences, University of Alberta //
Moran, Logan, Department of Physics, University of Alberta //
Ady, Nadia, Department of Computing Science, University of Alberta //
Merhej, Shadi, Department of Mathematical and Statistical Sciences, University of Alberta //
Dumitrescu, Cristian, Department of Mathematical and Statistical Sciences, University of Alberta

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Speakers:

Keynote Speakers: ///

Vincent Bouchard, Department of Mathematical and Statistical Sciences, University of Alberta. ///

{Why physics is better than math :-)} //

The number of fascinating results (many of them still conjectural) in various areas of mathematics, such as geometry, topology and number theory, that have been obtained via string theory in recent decades is mind-boggling. In this colloquium I will try to explain how theoretical physicists think, and why all these conjectural results coming out of string theory should not really come as a surprise. As an example, I will explore new captivating connections between enumerative geometry, a mysterious recursive structure that originated in random matrix theory, and the WKB asymptotic method for solving ordinary differential equations. While these topics may seem quite distant at first, it turns out that they are closely related via string theory; moreover, the resulting interconnections may shed light on some important conjectures in mathematics, such as the AJ conjecture (also known as quantum volume conjecture) in knot theory. By the end of the talk, you should hopefully be convinced of "the unreasonable effectiveness of string theory in mathematics!" ///

Karen Buro, Department of Mathematics and Statistics, MacEwan University ///

{Statistics is Beautiful} //

Bertrand Russell observed almost a century ago â€œMathematics, rightly viewed, possesses not only truth, but supreme beautyâ€•. This talk aims to highlight beauty in mathematical and applied statistics and to discuss why statistics is not only beautiful but also very useful and should be considered an important skill for students of mathematics. ///

Shaun Fallat, Department of Mathematics and Statistics, University of Regina ///

{Making Connections: My (short) Journey Navigating Mathematical Research...} //

I have always been fascinated by some of the links and connections formed in all branches of mathematical investigations. For me, deriving such interrelations has propelled my research program in many different directions -- both positive and negative! My lecture will highlight, by example, some connections that have successfully driven by own research. For instance: Zero forcing, graph colourings and multiplicities; tridiagonal matrices and interlacing; and the enhanced principal rank characteristic sequences. ///

Terry Gannon, Department of Mathematical and Statistical Sciences, University of Alberta ///

{Moonshine for beginners} //

{It has been claimed that 196884=196883+1. That this is indeed true, is a corollary to a theorem which won someone a Fields Medal. In my talk I'll try to explain what this is all about, and also describe a more recent variation on the same theme. ///

Mark Lewis, Department of Mathematical and Statistical Sciences, University of Alberta ///

{Mathematical models for territories} //
Mathematical models can help us understand the formation of complex spatial patterns, including the territories of wolves and coyotes. Here scent marks provide important cues regarding the use of space. In this talk I will show how biologically-based mechanistic rules can be put into a mathematical model which predicts the process of territorial formation as individuals create and respond to scent marks. The model predicts complex spatial patterns which are seen in nature, such stable `buffer zones' between territories which act as refuges for prey such as deer. The mathematical work is supported by detailed radio-tracking studies of animals. I will also employ the approach of game theory, where each pack attempts to maximize its fitness by increasing intake of prey (deer) and while decreasing interactions with hostile neighboring packs. Here the predictions are compared with radio-tracking data for wolves and coyotes. Finally I will show how a version of the territorial model has been applied to human populations in understanding spatial patterns arising from conflict between urban gangs. ///

Lorna Stewart, Department of Computing Science, University of Alberta ///

{Games on interval and permutation graph representations} //
We examine the idea of playing impartial two-person games on interval and permutation graph representations. Although the games are PSPACE-complete in general, some of them can be solved efficiently when the input graph is a tree. ///

As there are so many student talks, those names, institutions, titles, and abstracts can be found in our program (attached).

Links:
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ccem.math.ca/2015
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File Uploads:
Additional Upload 1: http://www.pims.math.ca/files/final_report/CUMC_2015_Program.pdf

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