



Newsletter

Winter 2015

Collaborative Research Group: Statistical Modelling of Complexly Correlated Data with Applications

Our CRG group was created with AARMS funding in August 2013 to provide a unique opportunity to bring Atlantic researchers from different areas together as a team to address challenging issues in the analysis of complexly correlated data. We held two workshops in the first year and are holding another in the second year. For each workshop, we invite some researchers outside of our group based on the workshop theme. The first workshop was held August 9-10, 2013 at the University of New Brunswick to get familiar with each other, to identify emerging issues and to explore collaboration opportunities. There were fifteen oral and six poster presentations by researchers, graduate students and postdoctoral fellows from statistics, biology, forestry, geology and veterinary epidemiology. In particular, two free-style open discussion sessions were held to stimulate collaborative research on challenging and emerging issues in the interdisciplinary areas. This workshop has fostered collaborations between statisticians and applied researchers in the spatial analysis of biological data, analysis of temporally correlated multivariate forestry data and analysis of compositional geological data.

The second workshop was held June 16-17, 2014 at Mount Saint Vincent University to communicate research progress and new projects. There were sixteen oral presentations. As new collaborative research projects between statistics and applied researchers had only started the previous year, the participants to this second workshop were mainly statisticians and their students. One distinctive feature of this workshop was a much stronger presence of graduate students, postdoctoral fellows, collaborators and non-group members. An extended student session was held to promote student participation.

The third workshop will be held June 12 – 13, 2015 at the University of Prince Edward Island, prior to the annual meeting of the Statistical Society of Canada (SSC) June 14-17. Further information about our CRG group can be found at: <http://www.math.unb.ca/~renjun/CRG/index.html>

- Renjun Ma



*participants of the CRG in Statistical Modelling
of Complexly Correlated Data with Applications*

Killam Professorship for Ed Susko

Dr. Edward Susko (Dalhousie University) was recently awarded a Faculty of Science Killam Professorship effective July 1, 2015 and continuing until June 30, 2020. Killam Professorships recognize the careers of the most outstanding scientists who have made great contributions to their field. Dr. Susko is also the recipient of the 2011 CRM-SSC Prize, awarded for outstanding research contributions in the statistical sciences within 15 years of receiving their PhD.

Dr. Susko's main research interests are in computational biology and bioinformatics with a particular emphasis on statistical issues in molecular evolution. Together with colleagues in biology and biochemistry, he develops methods that can be used to reconstruct evolutionary trees and to better understand evolutionary processes at the molecular level. His research contributions include methods that adjust for substitution rate variation over lineages and genes, detecting lateral gene transfer between organisms, using evolutionary distances to estimate evolutionary trees and methods to design phylogenetic studies. A major research emphasis has been the development of measurements of uncertainty about evolutionary relationships. The work has led to methods more broadly useful for statistical problems involving unusual parameter spaces.

News

Domain Decomposition Methods for PDEs: Short Course + Collaborative Workshop

Aug. 4, 2015 — Aug. 8, 2015 - Halifax, NS, Canada

The use of computational methods to treat mathematical models in science and engineering is widespread. Such models often involve PDEs, and the efficiency of these algorithms on modern high performance computing systems relies on the ability to parallelize the computations. The aim of this workshop is to provide an introduction to the state of the art in theory and practical applications of domain decomposition (DD) methods for PDEs. DD methods are a divide and conquer approach to solving PDEs, splitting the global problem into small pieces whose solutions are obtained on individual processors or cores. These local solutions are then recombined to give a solution to the global problem.

The program will begin with a two-day short course given by Prof. Martin Gander (Geneva). Prof. Gander is an internationally recognized leading expert in Schwarz methods - a class of DD methods for steady state and time dependent PDEs. Prof. Gander has taught similar courses in Europe and Asia. The middle component of the program will focus on presentations by researchers whose work may benefit from the use of DD methods for PDEs arising as mathematical models in practical applications. The final segment of the program will feature a workshop format in which breakout teams will investigate the process of introducing DD techniques into the numerical simulations that arise in the applications identified earlier. This segment will also include several talks by researchers working in DD methods.

The organizers invite participation by researchers in DD methods for PDEs, researchers working in applied PDEs whose work may benefit from the use of DD methods for PDEs, and students and postdocs. Researchers, students and post-docs will also participate through the collaborative workshop teams.

Confirmed DD experts include David Keyes (Kaust), Victorita Dolean (Nice) and Felix Kwok (Hong Kong Baptist). Some funding for students will be available.

More information about accommodations and registration are available through the workshop webpage at <http://www.math.mun.ca/anasc/ddworkshop.html>

Organizers:

Herman Brunner (Hong Kong Baptist and Memorial)
Ronald D. Haynes (Memorial)
Paul Muir (Saint Mary's)
David Iron (Dalhousie)

Education Students and Outreach

Mathematical outreach efforts in New Brunswick continue to benefit from the support of AARMS. As a professor in the Faculty of Education at UNB, I have enhanced efforts this year to bring students out to schools. This semester, in particular, has offered an opportunity to engage a small class of pre-service teachers directly in outreach. A grade 5 class in Fredericton was visited in January with education students supporting efforts. Then two weeks later the students returned to teach the class and lead various activities. Another visit was made to a local middle school. All students involved in the aforementioned visits are in the secondary math option and spend Mondays and two extended teaching placements at middle/high schools, with the majority of them having science backgrounds. Quotes from students including the following reflect the merits of direct participation in such endeavours.

The outreach section of your course was by far the most valuable. I saw amazing differences between schools, from the fifth graders at an elementary school who most likely outperform 8th graders in another school to a morning with a support intervention worker at a middle school.

I have seen two ends of the spectrum. Beyond that the outreach allowed me to implement many of the games that you taught us.

It was great to see students having so much fun doing math, a class that in both my personal and my practicum experience has been less than thrilling.

An elementary education student, Whitney Burke-Callaghan, expressed an interest in coming to a school on a Monday if an outreach event was planned. She joined two of the secondary students as volunteers to enable a morning of math at Nackawic with students in Grades 2 to 5. Math activities occupied the gymnasium for four hours. The highlight was basketball math, an event requiring students to work in teams to solve math challenges and sink baskets. Submission of a correct answer precedes sinking a basket that leads to receiving another question. (Feel free to contact me if you have questions about how this works.)

The elementary education students presented poster presentations at a middle school this past fall. Whitney's topic was hexaflexagons, and she accepted an invitation this term to present the topic to our class of secondary students. This is an example of a spinoff of outreach, as interesting ideas shared in one context find their way into others.

The outreach efforts with students formally concluded with participation at STEAM Expo, an annual local school district event featuring K-12 projects and attended by hundreds of people of all ages. (See the Winter 2014 newsletter for more details.) Students prepared geometric projects and facilitated

mathematical play with a wide range of games at the event held on Saturday March 14th. The recreational math exhibit has become a regular feature of the event. Hence, returning visitors and others who grasp the chance to play games with their own teachers add to the atmosphere.

The culminating event of the STEAM Expo was a perfect finish. Although no one really used my exhibit personally playing logic and reasoning games with the kids allowed me to see that they have potential far beyond what the classroom allows them to present. A girl from my class at the placement school was reasoning at a level comparable to myself. It was nice to be on a level playing field, for her to feel like the equal to a teacher and for us to work together to solve a variety of questions. She never doubted to question my judgment, or ask me to question her own. This kind of interaction is valuable and unfortunately rare in the classroom.

In closing, other comments from education students capture the spirit.

My experience with math outreach has benefitted me as a teacher because it has allowed me to expand the way I teach math and it has given me strategies for getting students excited about learning math.

Having the opportunity to do math outreach throughout this term has really helped me open up my eyes to the fun and different ways in which you can approach math as a teacher. It's the most rewarding experience to hear students who say they usually dislike math get really excited about it, because they suddenly feel like math can be fun. It has also allowed me to see all different kinds of learning environments, and pick up lots of great teaching tips and tricks along the way!

*- John McLoughlin (UNB)
with contributions from Whitney Burke-Callaghan,
Adrian Ireland and Kayla Lentz*

Accelerate Discovery Using ACENET

ACENET helps accelerate discovery in Atlantic Canada by providing advanced research computing resources, expertise and support to researchers, government organizations and industry. Advanced research computing involves clusters of computers working together to solve problems that are either too large or too complex for traditional desktop computing. These could be computationally intensive, data intensive, or both.

Established in 2006, ACENET is a consortium of universities in Atlantic Canada and the regional partner of Compute Canada, the national organization responsible for advanced research computing in Canada.

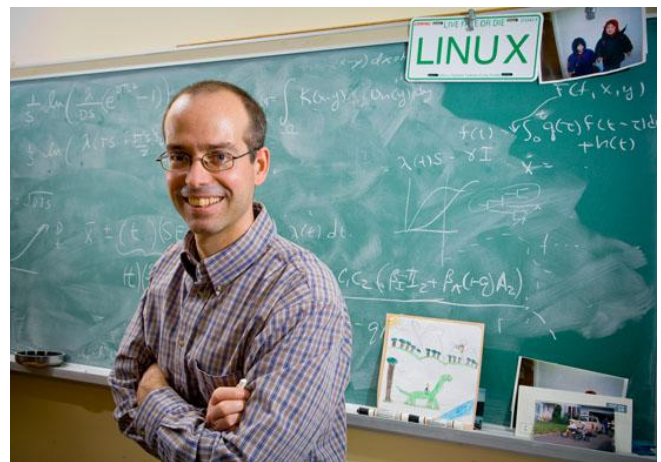
In addition to access to national cyber-infrastructure, ACENET helps researchers determine computing requirements, optimize and troubleshoot code, and customize tools. It offers

in-depth collaboration where needed, and provides training and support for individuals and groups from novice to advanced. Partner institutions house sophisticated video-conferencing facilities, and Saint Mary's University hosts a 3D visualization room and tools.

Used by scientists, mathematicians, engineers and other disciplines, the result is a reduced timeline, often by years, for discovery, innovation, and commercialization. Through its resources and computational research expertise, ACENET has accelerated the pace of pure and applied research in Atlantic Canada and advanced our capabilities in science and technology. For more information, visit www.acceleratediscovery.ca, or email info@ace-net.ca.

- Michele Fash, ACE-net

James Watmough Named UNB Research Scholar



Dr. James Watmough (University of New Brunswick) was recently named one of UNB's University Research Scholars for 2015. These awards are given to researchers who have demonstrated a consistently high level of scholarship, and whose research is, or has the potential to be, of international stature.

Dr. Watmough's interests lie in both mathematics and theoretical biology and in particular, the development and analysis of individual based models. His interests include crop colonization by the Colorado Potato Beetle, dispersal and territoriality of salmonids, and disease transmission in heterogeneous populations.

Call for Proposals

We encourage mathematicians in Atlantic Canada to suggest programmes or themes for future AARMS activities in the region (workshops, conferences) and to submit all applications for funding to our online system. Proposals are usually expected to show a detailed program with a budget and a significant number of confirmed speakers. They must also include a budget table showing projected total revenues and expenses. In general AARMS is not in a position to fund indefinite continuing activities. Successful applicants will be expected to produce a report on their event. Deadline: May 15, 2015

Mathematical Modeling in Industry Workshop: A student reports

Last summer, I luckily got a chance to attend the Mathematical Modeling in Industry Workshop from Aug 6th to Aug 15th at the University of British Columbia, Vancouver, BC. I was thrilled to receive the acceptance letter as a third year undergraduate student. This workshop aimed at providing students from North America with first hand experience in industrial research and it was jointly sponsored by the Pacific Institute for the Mathematical Sciences (PIMS) and the Institute of Mathematical and its Applications (IMA), with the support of Mprime. All the participating students were divided into seven teams and worked under the guidance of an industry mentor who helped us in the modeling process.

The first feeling that the UBC campus brought to me was tranquil and peaceful when I arrived at the University of British Columbia. There was either an attractive scenery or incredible architecture everywhere on campus as it is said to be the most beautiful campus in Canada. In the meantime, I also felt that it was a really large and multicultural university with a great diversity.

However, more stress and frustrations came out after I settled down and gradually got to know and be familiar with people involved in. I learned that almost all the participating students were graduate students coming from top universities from North America. And I had to admit that I actually did not have too much confidence at that time as just a young inexperienced undergraduate student.

Needless to say the beginning was really tough. I was in Team 2 and our group project was Quantifying the Uncertainty of Fish Ages. Our mentor was a Canadian but speaking British English and was born in England. Two group members were originally from Mexico doing their PhD right now and one had just completed her Master's degree. The first few days I did not understand some of the statistical approaches they discussed.

However, I was getting better and better everyday. With the encouragement of my lovely group members, I caught up with the places I have not figured out in the day and read more related papers so that I was quickly immersed in our project. I still remember the nights we studied at the campus and mathematical department libraries of the University of British Columbia.

Under the guidance of our mentor, we simplified the dataset which contains the estimation of ages of individual species of two rockfish species, Pacific Ocean Perch and Redbanded Rockfish, in order to make it more manageable. We drew all kinds of graphs using statistical software for the purpose of analysis and prediction. One interesting discovery was that the fish age data were all from otoliths that I did not know before.

During those days, being the members of the most international group among seven teams, we worked together in the day and rambled in the famous campus beach at dusk. Sometimes we intensively discussed particular questions while respecting each others' ideas. We also viewed the fabulous sight of the Stanley Park and had feasts in the restaurants downtown together. We enjoyed each other every time we were together.

On the last day, I realized that I had already fallen in love

with this project, this group and this place. I did not remember when we became just like a family but only knew we had always strived together just for one goal. There are no doubts that not only did I learn a lot of new knowledge but also good personal qualities from the gifted workshop participants. I really appreciate this opportunity and would like to share my experience.

- Xiaoying (Jennifer) Deng



East Coast Combinatorics Conference and Graphs-and-Games mini-workshop

The 10th ECCC will be held July 27-28th 2015 at Mount Allison University, Sackville NB, followed by a Graphs-and-Games mini-workshop on July 29th at Mount Allison University.

The East Coast Combinatorics Conference series is designed to bring together mathematicians and computer scientists interested in all aspects of combinatorics. The scope of the conference is intended to cover most aspects of modern combinatorics, including but not limited to graph theory, extremal combinatorics, combinatorial optimization, probabilistic combinatorics, combinatorial number theory, design theory, finite geometries, and applications of combinatorics to computer science. The conference will include 2 plenary speakers (50 min) as well as contributed talks (25 min). Anyone wishing to give a talk should contact mmessinger@mta.ca.

The AARMS Graphs-and-Games Collaborative Research Group will host a mini-workshop at Mount Allison University on July 29th. This workshop will provide a venue for undergraduate students to give (15 min) talks on their in-progress summer research projects. The workshop will also include a problems session in which (undergraduate-friendly) research problems will be presented. The participants will subsequently break into groups to attack these problems collaboratively (following the model of the Graphs-and-Games workshop held at St. Francis Xavier University in August 2014). Although this workshop is "undergraduate friendly", faculty and graduate students are encouraged to participate. Please contact mmessinger@mta.ca for more information.

Recent and Upcoming Events

Atlantic General Relativity 2015

Organizer: Sanjeev Seahra and Viqar Husain
Location: University of New Brunswick
Date: May 6-7, 2015
Contact Information: Sanjeev Seahra

Applied Mathematics in Environmental sciences

Organizer: Salah El Adlouni
Location: Rimouski, QC
Date: May 26, 2015
Contact Information: Salah El Adlouni

Sessions at the CMS Summer Meeting

Location: UPEI, Charlottetown
Date: June 5-8, 2015
Contact Information: Paul Glover

Dynamical Systems with Applications to Biology and Ecology
Number Theory
Rigorous computation for differential-equation problems
Games and Pursuit Games on Graphs
Interplay of Convexity and Geometric Analysis
Ergodic Theory, Dynamical Systems and Applications
Optimization and Nonlinear Analysis
Singularities and Phase Transitions in the Calculus of Variations and PDE
Graphs, Designs, and Hypergraphs
C*-algebra
Recent advances in the mathematics of electromagnetic and acoustic imaging

Statistical and Computational Analytics for Big Data

Organizers: Hugh Chipman, Nancy Reid, Stan Matwin
Location: Dalhousie, Halifax
Date: June 12-13, 2015
Contact Information: Hugh Chipman

International Symposium in Statistics

Organizers: Brajendra Sutradhar et al
Location: Memorial University, St. John's
Date: July 20-22, 2015
Contact Information: Brajendra Sutradhar

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

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

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"Mathematics has beauty and romance. It's not a boring place to be, the mathematical world. It's an extraordinary place; it's worth spending time there.

~ Marcus du Sautoy