Retreat for Young Researchers in Stochastics

Chris Hoffman (U. Washington), Mike Kouritzin (U. Alberta),
Ed Perkins (UBC).

Sept. 23/16–Sept. 25/16

1 Overview

This was the second annual meeting of the PIMS Postdoctoral Training Centre in Stochastics (PTCS). The Retreat offers an opportunity for young probabilists or users of probabability from Western Canada and Washington state to interact, communicate their recent results and ongoing research programs and initiate new collborations. All seven of the postdoctoral fellows supported by the PTCS spoke at the meeting. The 26 participants also included young postdoctoral fellows from U. Saskatchewan and Microsoft Research, PhD students from U. Washington and U. Calgary, and senior faculty from U. Calgary, U. Alberta, Simon Fraser University, U. Washington and UBC.

The response from the participants after the retreat was hugely positive.

2 Presentation Highlights

The range of topics presented demonstrated the ubiquity of probability in modern mathematics. Topics included applications in knotting of DNW molecules, mathematical finance, geometric measure theory, applications of compressed sensing in pde, and inference for the initial state for tree growth models.

A highlight of the presentations was Mathav Murugan's (PTCS, UBC) presentation of a stable characterization of the Elliptic Harnack Inequality (EHI) on weighted graphs. This was the first announcement of this fundamental work with Martin Barlow [1]. The EHI for harmonic functions establishes Holder regularity of harmonic functions and implies that bounded harmonic functions on the space are constant (the Liouville property). It is weaker than the parabolic Harnack inequality but holds in a number of important instances when the latter does not (such as diffusions on fractals). One can often verify it for special graphs but then one would like to infer it for other graphs where, for example, the conductances are comparable. This type of inference is referred to as stability of the property. Their main results characterizes the EHI in terms of stable properties: a volume doubling measure for which a Poincare inequality and a cutoff Sobolev inequality hold with respect to a novel space-time scale function. It is a result which has eluded the experts since 2006 when the analogous result for the parabolic Harnack inequality was proved by Barlow and Bass.

In a completely different direction, Simone Brugiapaglia (PTCS, SFU) spoke on his work in a newly emerging field–the use of compressed sensing methods to numerically solve partial differential equations such as the two-dimensional Stokes problem and advection-diffusion-reaction equations in 3 and fewer dimensions. He showed how randomized sparse recovery methods can significantly lower computational costs. The theoretical error analysis relied on large deviation bounds for random matrices. The field is one where there are strong groups at both SFU and UBC and where Simone's presence (who is being co-supervised by Ben Adcock at SFU and Yaniv Plan at UBC) will help bring the groups together.

Noah Forman (PTCS, UW) presented his work on partition-valued diffusions which give dynamics associated with the two-parameter Poisson-Dirichlet distributions arising in population genetics. The dynamics underlying Forman's construction give an important step in constructing a continuum analogue of Aldous' tree-valued Markov Chain with dynamics corresponding to simple insertion and deletion of branches on a binary tree. The construction of such a continuous process, which would have Aldous' CRT as its stationary distribution, has been an open problem since the 90's. Forman's lecture generated a lot of discussion in the free time.

3 Outcome of the Meeting

A number of the participants wrote after the meeting, all expressing thanks for a stimulating meeting.

Noah Forman's lecture led to a stimulating discussion and an ongoing collaboration with Omer Angel (UBC) on an approach Omer had towards Aldous's conjectured diffusion on CRTs.

References

[1] M.T. Barlow and M. Murugan, Stability of elliptic Harnack inequality, Math ArXIv 1610.01255.