

# Retreat for Young Researchers in Stochastics

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## 1 Overview

This was the third annual meeting of the PIMS Postdoctoral Training Centre in Stochastics (PTCS). The Retreat offers an opportunity for young probabilists or users of probability from Western Canada and Washington state to interact, communicate their recent results and ongoing research programs and initiate new collaborations. The participants were 9 postdocs, either supported by PTCS or members of the PTCS network, 5 junior faculty at PIMS Universities, and 9 senior faculty from PIMS Universities; many of those in the last group are advisors for PTCS postdocs.

## 2 Presentation Highlights

The range of topics presented covered many of the active areas in modern probability, and included stochastic differential equations and stochastic partial differential equations, stochastic perturbations of dynamical systems, ergodic theory, compressed sensing and epidemic models in mathematical biology.

Noah Forman (PTCS, UW) presented his work on dynamic random trees. These arise in models in population genetics. The main result gives an extension to random trees of the classic characterization of exchangeable random variables on  $\mathbb{N}$  as a mixture of independent sequences. The lifting of this result to the tree case requires a number of pruning and re-grafting operations on random trees. This work raises several interesting problems concerning the limiting object, which is the continuum random tree of Aldous.

Eric Foxall described an epidemic model (the ‘stochastic logistic model’) on a network. His talk presented the simplest case, that of a complete graph, and gave a detailed analysis of the structure and limits of the model near the critical point. The complete graph has little geometric structure, and a long term goal of this research is to look at networks with more interesting and realistic geometry.

The talks by Gerrardo Barrera Vargas and Zhonwei Shen looked at small stochastic perturbations of dynamical systems. This area has quite classical roots – the pioneering work of Ventsel and Freidlin was in the late 1960s, but our understanding of the connections between ‘chaotic dynamics’ and ‘stochastic dynamics’ is very incomplete. The research group of Y. Yi at U. Alberta is now very active in this area, and this workshop was helpful in building links between this group and the probability groups at UBC and UW.

Shirou Wang described new work in ergodic theory, which gives that the entropy map upper semi-continuous for a class of dynamical systems.

Wenning Wei described her work with S. Tang (Fudan U.) on Hölder regularity in space of solutions to Backwards Stochastic PDE. (BSPDE). BSPDE’s arise for example in optimal control problems for (forward) SPDE’s. For a particular class of linear BSPDE’s they are able to show the solution has sufficient smoothness in space to give the BSPDE a classical interpretation. A key idea is to consider spatial regularity into the

space of  $L^2$  functions of time, which is a novel perspective and gives new results, even for the deterministic setting.

Simone Brugiapaglia discussed his recent work with Ben Adcock (SFU) and Casie Bau (Grad student now at UBC) on sparsity-based approaches for high dimensional function approximation.