



*Institute of Mathematical Research
Department of Mathematics*

GEOMETRY SEMINAR

Analytical and Topological Aspect of Signatures

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Abstract

In both physical and social sciences, we usually use controlled differential equation to model various continuous evolving system; describing how a response y relates to another process x called control. For regular controls x , the unique existence of the response y is guaranteed while it would never be the case for non-smooth controls via the classical approach. Besides, uniform closeness of controls may not imply closeness of their corresponding responses. Theory of rough paths provides a solution to both concerns. Since the creation of rough path theory, it enjoys fruitful development and finds wide applications in stochastic analysis. In particular, rough path theory provides an effective method to study irregularity of curves and its geometric consequences in relation to integration of differential forms.

In this talk, I shall introduce an overview of some recent applications of the theory of rough paths in geometry. For example, I shall extend our belief to the context of complex analysis. On the other hand, imagine that any geometric objects, in some senses appearing as solids, are actually comprised of filaments; I shall identify a sensible way to do geometric calculus via these filaments, more precisely, space-filling rough paths. Finally, in a recent work by Lyons, it is shown that every rectifiable path can be completely characterized, up to tree-like deformation, by an algebraic object called the signature of the path. It is obvious that all tree-like deformation of the path would not change its topological features. Therefore, it should be possible to extract the topological information of a curve out from its signature since the later is a complete algebraic invariant. Another objective of my talk is to illustrate how one can express winding numbers of a path (linking numbers of a pair of paths) in terms of the signatures of the underlying path (joint signature of the pair of paths).

Date:	September 24, 2008 (Wednesday)
Time:	4:30 – 5:30pm
Place:	Room 206, Run Run Shaw Bldg., HKU

All are welcome