
AARMS-CMS Student Poster Session
Présentations par affiches des étudiants - AARMS-SMC
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BENJAMIN BLANCHETTE, Université du Québec à Montréal

Quasi-automatic semigroups

A *quasi-automatic semigroup* is a finitely generated semigroup with a rational set of representatives L such that the graph of right multiplication by a generator on the set L is a rational relation. We present here three results on that newly defined class of semigroups. First, we show that the word problem of such a semigroup is decidable in exponential time. We then show that a generalised form of the Lipschitz property of automatic semigroups holds for quasi-automatic semigroups. Finally, we show that a quasi-automatic semigroup which happens to be a group has a finite presentation along with an exponential isoperimetric inequality.

JONATHAN GODIN, Université de Montréal

Classification locale de la dynamique d'un point fixe parabolique

Étant donné une fonction holomorphe $f: U \rightarrow V$, avec $V \subseteq U \subseteq \mathbb{C}$, on obtient un système dynamique discret par itération de f . Pour comprendre la dynamique, il est essentiel d'étudier le comportement local des points fixes. Les dynamiques possibles d'un point fixe z_0 dit parabolique, lorsque $f'(z_0) = 1$, ont été complètement classifiées par le module d'Écalle-Voronin. Ce module est formé d'une partie formelle, exprimé par un nombre complexe, et d'une partie analytique qui ressort de la géométrie compliquée du système. On présentera une classification des points fixes paraboliques d'une fonction antiholomorphe. Pour ce faire, on introduira un module de classification analogue au cas holomorphe.

JUPING JI, University of New Brunswick

Qualitative analysis on a nutrient-phytoplankton model with toxic effect of Holling-III functional

We propose a nutrient-phytoplankton model with toxic effects governed by the Holling-type III functional and conduct qualitative analysis on the system and its steady state problem. We obtain some conditions which ensure the system undergo some bifurcations at the positive equilibria, then we will present some numerical simulations to illustrate our theoretical analysis.

NAVANEETH MOHAN, Western University

Detection of Chaos in Blood Pressure Recordings

Time series analysis of blood pressure recordings reveals the presence of low-dimensional, aperiodic, non-linear dynamics governing the blood pressure fluctuations. Further, the dynamics has a positive Lyapunov exponent.

KAVEH MOUSAVAND, Université du Québec à Montréal

tau-Tilting Theory of Gentle Algebras

A modern generalization of tilting theory, called τ -tilting theory, has been recently introduced by Adachi, Iyama and Reiten. Among the various areas of research that τ -tilting theory has already contributed to, in addition to representation theory of algebras, one can mention cluster algebras, stability conditions in physics, combinatorics, lattice theory, etc.

In this poster, I present some of the major results of my joint work with LaCIM Representation Theory Working Group in which we studied τ -tilting theory of gentle algebras. In particular, over the aforementioned family of algebras, which benefit from rich combinatorics, we give a conceptual model for τ -tilting modules.

ANDREW WARREN, Carnegie Mellon University

Local stability and ergodic theorems for amenable groups

There are analogues of many classical ergodic theorems where, instead of considering the action of a single transformation on a measure space, one considers the action of a group with certain geometric properties. However, outside of a few special cases, explicit versions of ergodic theorems for group actions (i.e., giving some quantitative information about the convergence of the ergodic average) are not known. Likewise, it is unclear whether the convergence behaviour is sensitive to the regularity of the function under consideration, analytic properties of the underlying space, etc. Here, we give a version of the mean ergodic theorem for amenable groups, where the ergodic average is specified by a Følner sequence. In this setting, we show there exists a uniform bound on the rate of metastability (or local stability) of the ergodic average which depends on an intrinsic convergence parameter of the Følner sequence itself. This extends the previous work of Avigad, Gerdard, and Towsner on local stability for the classical mean ergodic theorem.

SUDAN XING, Memorial University

The dual Orlicz-Minkowski problem

In 2016, Huang-Lutwak-Yang-Zhang proposed the dual L_p curvature measures and solved the L_p dual Minkowski problem for $0 < p \leq n$ in their seminal paper published in Acta Mathematica.

Our main result is the dual Orlicz-Minkowski problem which is a special generalization of their work. These problems are dual to the Orlicz-Minkowski problems (extensions of the classical Minkowski problem involving nonhomogeneous functions). That is: *for a continuous function $\varphi : (0, \infty) \rightarrow (0, \infty)$ and μ a given nonzero finite Borel measure on the unit sphere, can we find a constant τ and a convex body K such that $\mu = \tau \tilde{C}_\varphi(K, \cdot)$?* Here $\tilde{C}_\varphi(K, \cdot)$ is the dual Orlicz curvature measure of K . Based on the established variational formula for the dual Orlicz quermassintegral, a solution to the dual Orlicz-Minkowski problem regarding the dual Orlicz curvature measure is provided. This poster is based on a joint work with Baocheng Zhu and Daping Ye.

WU YIFEI, McMaster University

How to use integration to find the area and volume of Fuwa(a Chinese doll)

In this poster, I am going to talk about how to use integration techniques to find out the estimated areas and volume of Fuwa. Why we need to calculate the volumes and area of Fuwa? The reason is that we need to know how many materials we need to buy in order to make one doll(Fuwa), in order to calculate total menus of our materials. I will first talk about the basic concepts of integration. And Then, showing the processes about how to calculate volumes of one Fuwa(doll) with integration techniques. And then, make a simple conclusion for my analysis.

KELVIN SHUANGJIAN ZHANG, University of Toronto

On concavity of the monopolist's problem facing consumers with nonlinear price preferences

A monopolist wishes to maximize her profits by finding an optimal price menu. After she announces a menu of products and prices, each agent will choose to buy that product which maximizes his own utility, if positive. The principal's profits are the sum of the net earnings produced by each product sold. These are determined by the costs of production and the distribution of products sold, which in turn are based on the distribution of anonymous agents and the choices they make in response to the principal's price menu. In this poster, we describe a necessary and sufficient condition for the convexity or concavity of the principal's problem, assuming each agent's disutility is a strictly increasing but not necessarily affine (i.e. quasilinear) function of the price paid. Concavity when present, makes the problem more amenable to computational and theoretical analysis; it is key to obtaining uniqueness and stability results for the principal's strategy in particular. This poster represents joint work with my Ph.D. advisor Robert McCann.