动力系统与应用研讨会

Workshop on Dynamical Systems and Applications

Date

2024-12-26 ~ 2024-12-31

Location

Venue: Room A-110, TSIMF
Online(Zoom): 815 762 8413, Password: BIMSA

Organizer

刘思序(Sixu Liu), BIMSA

题目和摘要(Titles and Abstracts)

On the phenomenon of topological chaos and statistical triviality

孙文祥(教授)

北京大学/河北师范大学

There exists a compact manifold so that the set of topologically chaotic but statistically trivial C^r ($1\leq r\leq\infty$) vector fields on this manifold displays considerable scale in the view of dimension. More specifically, it contains an infinite-dimensional connected subset. This is a joint work with Xiankun Ren, Chao Liang and Edson Vargas.

Entropy rigidity and flexibility for 3D Anosov flows

杨云(助理教授)

Virginia Tech

Anosov systems are among the most well-understood dynamical systems. Special among them are the *algebraic* systems. In this talk, we will show that given an integer $k\geq 5$, and a C^k Anosov flow Φ on some compact connected 3-manifold preserving a smooth volume, the measure of maximal entropy is the volume measure if and only if Φ is $C^{k-\varepsilon}$-conjugate to an algebraic flow, for $\varepsilon>0$ arbitrarily small. We will also explore some results on the entropy flexibility of 3D contact Anosov flows and suspension Anosov flows.

Exponential specification property and its applications

侯晓博(博士后)

复旦大学

This talk mainly focuses on the exponential specification property and its applications. A brief history of the exponential specification property and some known results will be recalled. Then, we give two applications of the exponential specification property. On the one hand, for dynamical systems with the exponential specification property, we find a type of strongly distributional chaos that is stronger than usual distributional chaos and Li-Yorke chaos. On the other hand, we estimate topological entropy and Hausdorff dimension of a shrinking target set for dynamical systems with exponential specification property and Lipschitz continuity for maps and homeomorphisms.

Crossover Designs for Random Subject Effects under Subject Dropout

孔祥顺(副教授)

北京理工大学

It is not uncommon to observe subjects dropping out of the study in crossover design experiments. A predetermined optimal crossover design may fail to produce informative data in such cases. In recent years, many studies have been on efficient crossover designs that are protected from subject dropout. However, all of them assumed the subject effects to be fixed, while it is typically more reasonable to assume the subject effects to be random in practice. This paper tries to identify crossover designs, which are efficient under the random subject model with subject dropout. Efficient designs are constructed for both direct and total effects.

Optimal Subsampling for Data Streams with Measurement-Constrained Categorical Responses

虞俊(副教授)

北京理工大学

High-velocity, large-scale data streams have become pervasive. Frequently, the associated labels for such data prove costly to measure and are not always available upfront. Consequently, the analysis of such data poses a significant challenge. In this article, we develop a method that addresses this challenge by employing an online subsampling procedure and a multinomial logistic model for efficient analysis of high-velocity, large-scale data streams. Our algorithm is designed to sequentially update parameter estimation based on the A-optimality criterion. Moreover, it significantly increases computational efficiency while imposing minimal storage requirements. Theoretical properties are rigorously established to quantify the asymptotic behavior of the estimator. The method's efficacy is further demonstrated through comprehensive numerical studies on both simulated and real-world datasets. This is a joint work with Zhiqiang Ye, Ping Ma, and Mingyao Ai.

Quasi-shadowing property for nonuniformly partially hyperbolic systems

廖刚(教授)

苏州大学

We establish a new quasi-shadowing property for any nonuiformly partially hyperbolic set of a $C^{1+\alpha}$ diffeomorphism, which is adaptive to the movement of the pseudo-orbit. As an application, we extend Katok's result on the growth of periodic orbits for hyperbolic ergodic measure to any ergodic measure: the number of quasi-periodic points grows exponentially in rate at least the metric entropy.

On construction of strong orthogonal arrays and column-orthogonal strong orthogonal arrays of strength two plus

姜博川(副教授)

北京交通大学

Computer experiments require space-filling designs with good low-dimensional projection properties. Strong orthogonal arrays are a type of space-filling design that provide better stratifications in low dimensions than ordinary orthogonal arrays. In this paper, we address the problem of constructing strong orthogonal arrays and column-orthogonal strong orthogonal arrays of strength two plus. Existing methods typically rely on regular designs or specific nonregular designs as base orthogonal arrays, limiting the sizes of the final designs. Instead, we propose two general methods that are easy to implement and applicable to a wide range of base orthogonal arrays. These methods produce space-filling designs that can accommodate a large number of factors, provide significant flexibility in terms of run sizes, and possess appealing low-dimensional projection properties. Therefore, these designs are ideal for computer experiments.

Core entropy for polynomials having connected Julia set

杨毅(助理教授)

中山大学(珠海)

The classical core entropy for a post critically finite (PCF) polynomial f with deg(f)>1 is defined to be the topological entropy of f restricted to its Hubbard tree. We fully generalize this notion by a new quantity, called the (general) core entropy, which is well defined whenever f has a connected Julia set. If f is PCF, the core entropy equals the classical version. If two polynomials are J-equivalent they share the same core entropy. If f is renormalizable, there is a direct connection between the core entropy of f and that corresponding to the small Julia set. We also analyze the map that sends every parameter c in the Mandelbrot set to the core entropy of the polynomial z^2+c.

具有复杂拓扑结构的流形上正定拉格朗日系统的动力学

王方(副教授)

首都师范大学

简要的介绍我们在具有复杂拓扑结构的紧致流形上正定拉格朗日系统的动力学行为方面所做的一些工作，特别是关于自治系统的拓扑熵与流形的基本群的代数增长率之间的关系，以及关于高亏格曲面上的同伦极小轨道和极小测度的性态的一些结果。

Gluing orbit property for set-valued maps

任宪坤(讲师)

重庆大学

In this talk, we will introduce the gluing orbit property for set-valued maps. We show that transitivity and shadowing property imply gluing orbit property. We also show that a set-valued map with gluing orbit property is either minimal or of positive topological entropy.

平均曲率流的动力学

薛金鑫(教授)

清华大学

Abstract: TBA

Arnold Tongues in Standard Maps with Drift

周晶(助理教授)

大湾区大学

In the early 60’s J. B. Keller and D. Levy discovered a fundamental property: the instability tongues in Mathieu-type equations lose sharpness with the addition of higher-frequency harmonics in the Mathieu potentials. Twenty years later, V. Arnold discovered a similar phenomenon on the sharpness of Arnold tongues in circle maps (and rediscovered the result of Keller and Levy). In this paper we find a third class of object where a similar type of behavior takes place: area-preserving maps of the cylinder. Loosely speaking, we show that periodic orbits of standard maps are extra fragile with respect to added drift (i.e. non-exactness) if the potential of the map is a trigonometric polynomial. That is, higher-frequency harmonics make periodic orbits more robust with respect to “drift". This observation was motivated by the study of traveling waves in the discretized sine-Gordon equation which in turn models a wide variety of physical systems. This is a joint work with Mark Levi.

Exploring Orbital Complexity through Entropy and Chaos in Dynamical Systems

袁艺(博士生)

复旦大学

This talk focuses on the characterization of orbit complexity and measure distributions in dynamical systems from the perspectives of entropy and chaos. Specifically:

1. Periodic measures with large support and exponential growth exhibit refined properties, which are precise extensions of K. Sigmund's density result on periodic measures and R. Bowen's entropy formula between the growth of periodic orbits and entropy.

2. The quantitative recurrence set exhibits strongly distributional chaos, providing a new perspective on the analysis of this set.

Moreover, these results can be applied to a broad class of symbolic dynamical systems introduced by V. Climenhaga, D. Thompson, and K. Yamamoto in 2016. This talk is based on joint work with Xiaobo Hou and Xueting Tian.

Bi-quasi-shadowing for semi-partially hyperbolic families

陈林(博士生)

重庆大学

In this talk, we introduce the concept of a semi-partially hyperbolic family and prove that semi-partial hyperbolicity implies partial hyperbolicity under certain conditions. We also establish that a semi-partially hyperbolic family possesses the bi-quasi-shadowing property.

Specification Property and Its Variations

林万山(博士生)

复旦大学

Since the specification property was introduced by Bowen in 1971, there are many studies about its properties and its variations. In this talk, we will review the specification-like properties in uniformly hyperbolic systems, non-uniformly hyperbolic systems and symbolic dynamical systems. After that, we will introduce the m-g-product property to study the residuality of irregular sets and the non-uniform specification property to study the influence of the gap function which appearing in the definition. Finally, we will use the specification-like properties to study the topological entropy of points with Bohr chaos. This is a series of works joint with Xiaobo Hou, Xueting Tian and Chenwei Yu.

Option Pricing Problem of Rough Heston Model with Jump Diffusion Process

刘子贺(博士生)

吉林大学

Compared with the traditional stochastic volatility model, the rough volatility model can better fit the financial market and hence is widely used. In this talk, we add the jump diffusion process to the rough Heston model, derive the characteristic function of the new model and the European option pricing formula.