

# 第一届奇异子流形的几何拓扑青年学者论坛日程表

2020 年 11 月 28 日（腾讯会议 ID: 255 694 282; 会议密码: 320321）			
13:00-13:30	开幕式		
	主持人	报告人	报告题目
13:30-14:30	裴东河	侯秉喆 (吉林大学)	Topologically conjugate classifications of the translation actions on low-dimensional compact connected Lie groups
14:40-15:10		马荣升 (东北师范大学)	Reeb flow invariant *-Ricci Operators on Trans-Sasakian three-manifolds
15:10-15:40		赵昕 (东北师范大学)	Evolutes of the (n,m)-cusp mixed-type curves in the Lorentz-Minkowski plane
15:50-16:20		李鹏程 (东北师范大学)	Evolutes and focal surfaces of (1, k)-type curves with respect to Bishop frame in Euclidean 3-space
2020 年 11 月 29 日（腾讯会议 ID: 896 119 904; 会议密码: 320321）			
8:30-9:30	陈亮	王骁 (吉林大学)	On Yang-Baxter homology
9:40-10:40		王咏乔 (大连海事大学)	Pseudo-spherical evolutes of lightlike locus on mixed type surfaces
10:50-11:20		李恩泽 (东北师范大学)	Envelopoids of Legendre curves in the unit tangent bundle over the Euclidean plane
11:20-13:30	午休		
13:30-14:30	王咏乔	李彦霖 (杭州师范大学)	A Survey on Topological Data Analysis
14:40-15:10		嵩雪 (东北师范大学)	Dualities for curves in null de Sitter 3-sphere
15:10-15:40		吴彤 (东北师范大学)	Gauss-Bonnet Theorem in the Genralized Affine Group and the Generalized BCV Spaces
15:50-16:20	闭幕式		

# 报告摘要

## **Topologically conjugate classifications of the translation actions on low-dimensional compact connected Lie groups**

侯秉喆（吉林大学）

**Abstract:** In this talk, we focus on the left translation actions on noncommutative compact connected Lie groups with topological dimension 3 or 4, consisting of  $SU(2)$ ,  $U(2)$ ,  $SO(3)$ ,  $SO(3) \times S^1$  and  $Spin^C(3)$ . We define the rotation vectors (numbers) of the left actions induced by the elements in the maximal tori of these groups, and utilize rotation vectors (numbers) to give the topologically conjugate classification of the left actions. Algebraic conjugacy and smooth conjugacy are also considered.

## **Reeb flow invariant \*-Ricci Operators on Trans-Sasakian three-manifolds**

马荣升（东北师范大学）

**Abstract:** In this talk, we investigate the \*-Ricci operators on trans-Sasakian three-manifolds. We find conditions at which \*-Ricci tensor on trans-Sasakian three-manifolds is symmetric and under which the \*-Ricci operators are Reeb flow invariant.

## **Evolutes of the $(n,m)$ -cusp mixed-type curves in the Lorentz-Minkowski plane**

赵昕（东北师范大学）

**Abstract:** In this talk, we use lightcone frame to define the  $(n,m)$ -cusp mixed-type curves and their evolutes in Lorentz-Minkowski plane. In order to attain this goal, we define the  $(n,m)$ -cusp non-lightlike curves and their evolutes in Lorentz-Minkowski plane first. Then we study the behaviors of the evolutes of the  $(n,m)$ -cusp mixed-type curves at the  $(n,m)$ -cusp.

## **Evolutes and focal surfaces of $(1, k)$ -type curves with respect to**

### **Bishop frame in Euclidean 3-space**

李鹏程（东北师范大学）

**Abstract:** In this talk, we will introduce  $(1, k)$  - type curves and the Bishop type frame. Meanwhile, we will give the geometric meaning of Bishop curvatures. Then, by using the Bishop frame, we define the evolutes and focal surfaces of  $(1, k)$  - type curves and discuss some singular properties of them. Moreover, the singularities of focal surfaces of  $(1, k)$  - type curves are classified according to the unfolding theory of the families of functions.

## **On Yang-Baxter homology**

王骁 (吉林大学)

**Abstract:** As a generalization of rack homology, Yang-Baxter homology is promising to be useful for knot theory. In this talk, we will start by introducing the concepts of (bi)racks, (bi)quandles and their homology theories. Then we give the definition of the Yang-Baxter homology for column unital Yang-Baxter operators. Finally, we give some recent results, regarding to computations of the homology of a family of Yang-Baxter operators giving the HOMFLYPT polynomial.

## **Pseudo-spherical evolutes of lightlike locus on mixed type surfaces**

王咏乔 (大连海事大学)

**Abstract:** A surface in the Lorentz-Minkowski 3-space is generally a mixed type surface, namely, it has the lightlike locus. We define two pseudo-spherical evolutes of lightlike locus and we study a relationship of singularities of these evolutes and differential geometric properties of lightlike locus.

## **Enveloids of Legendre curves in the unit tangent bundle over the Euclidean plane**

李恩泽（东北师范大学）

**Abstract:** We define  $\theta$ -enveloids for one-parameter families of Legendre curves. The  $\theta$ -enveloid for a given one-parameter family of Legendre curves is a plane curve that cuts each member of the family in the same constant angle  $\theta$ . As an application, we consider the definition of involutoids of frontals on the view point of  $\theta$ -enveloids. Moreover, we give relationships among  $\theta$ -enveloids, 0-enveloids (classical envelopes) and  $\pi/2$ -enveloids (normal-envelopes).

## **A Survey on Topological Data Analysis**

李彦霖（杭州师范大学）

**Abstract:** Topological data analysis (TDA) is an approach to the analysis of datasets using techniques from topology. Extraction of information from datasets that are high-dimensional, incomplete and noisy is generally challenging. TDA provides a general framework to analyze such data in a manner that is insensitive to the particular metric chosen and provides dimensionality reduction and robustness to noise. Beyond this, it inherits functoriality, a fundamental concept of modern mathematics, from its topological nature, which allows it to adapt to new mathematical tools. The initial motivation is to study the shape of data. TDA has combined algebraic topology and other tools from pure mathematics to allow mathematically rigorous study of "shape". The main tool is persistent homology, an adaptation of homology to point cloud data. The unique features of TDA make it a promising bridge between topology and geometry. In this presentation, I will provide a survey on Topological data analysis.

## **Dualities for curves in null de Sitter 3-sphere**

嵩雪（东北师范大学）

**Abstract:** In this paper, we investigate the curves in the de Sitter 3-sphere in the future nullcone. The de Sitter 3-sphere can be canonically embedded in the future nullcone and anti-de Sitter 4-space in semi-Euclidean 5-space. It is found that the nullcone dual hypersurfaces have some singularities whose types can be characterized by the geometric invariant. Using the theory of Legendrian dualities on pseudo-spheres and the theory of contact manifolds, it is revealed that there exists the dual relationships between the de Sitter sphere curves and nullcone dual hypersurfaces, respectively. Moreover, it is shown that the projections of the critical sets of focal surfaces to the de Sitter 3-sphere are equal to the spherical evolutes of the curve in de Sitter 3-sphere. Finally, we indicate the explicit example to illustrate the theoretical results.

## **Gauss-Bonnet Theorems in the Generalized Affine Group and the Generalized BCV Spaces**

吴彤（东北师范大学）

**Abstract:** In this talk, we compute sub-Riemannian limits of Gaussian curvature for a Euclidean  $C^2$ -smooth surface in the generalized affine group and the generalized BCV spaces away from characteristic points and signed geodesic curvature for Euclidean  $C^2$ -smooth curves on surfaces. We get Gauss-Bonnet theorems in the generalized affine group and the generalized BCV spaces.