



第二届奇异子流形的几何与拓扑

青年学者论坛

会议手册

主办单位：东北师范大学

2022 年 11 月 26 日--27 日

奇点理论是当代数学中一个非常活跃的重要分支，广泛应用于微分几何、代数几何、微分方程等数学的其它分支以及物理等多种其它学科。为了进一步推动奇点理论的学术研究，展现当前映射的奇点理论学科前沿和发展动向，同时为了加强国内相关专家、青年学者间的相互交流、学习与合作，我们拟定于 2022 年 11 月 26 日--11 月 27 日举办“第二届奇异子流形的几何与拓扑青年学者论坛”。由于受新冠肺炎疫情影响，本次会议采用线上形式进行。

★ 会议时间

2022 年 11 月 26 日--11 月 27 日

★ 会议地点

腾讯会议：412957682

密码：6382

★ 组织者（姓氏拼音排序）

陈亮，孔令令，裴东河，瞿枫，沈广艳，陶辰，王勇，张发泽

★ 资助方

国家双一流学科建设经费

国家自然科学基金 NSFC#12271086

会议日程

2022 年 11 月 26 日（腾讯会议 ID：412957682；会议密码：6382）			
时间	主持人	报告人	报告题目
08:20-08:30	陈 亮	开幕式	
08:30-09:30	王志刚	杜 荣 (华东师范大学)	Pinched theorem for compact Kahler-Einstein manifolds
09:30-10:20		王咏乔 (大连海事大学)	Envelopes created by circle families and pseudo circle families in the plane
10:20-10:30	休息		
10:30-11:20	王咏乔	李强 (齐齐哈尔大学)	Bifurcation Model for Euler Buckling problem with Neumann BVP
11:20-11:50		于海波 (东师博士生)	Focal surfaces and evolutes of framed curves in the Riemannian 3-space form from the viewpoint of Legendrian duality
11:50-13:30	午休		
13:30-14:20	李 强	刘海明 (牡丹江师院)	Cuspidal beak of de Sitter surface for timelike curve in Minkowski space-time
14:20-15:10		赵昕 (青岛大学)	Pedal and contrapedal curves of mixed-type curves in the Lorentz-Minkowski plane
15:10-15:40		李则雯 (东师博士生)	Framed Isophote Curves on the Framed Surface
15:40-15:50	休息		
15:50-16:40	刘海明	李彦霖 (杭州师范大学)	Developable surfaces and their singularities
16:40-17:10		姚凯鑫 (东师博士生)	Pedal and contrapedal curves of non-lightlike framed curves in Minkowski 3-space
17:10-17:40		许博源 (东师博士生)	Lightlike Curve with Singlarities in Minkowski 3-space

2022 年 11 月 27 日（腾讯会议 ID：412957682；会议密码：6382）

时间	主持人	报告人	报告题目
08:30–09:20	姜 杨	孙建国 (中国石油大学)	几类特殊曲线的微分几何性质研究
09:20–09:50		张姝玥 (东师博士生)	Pedal and Contrapedal Curves in Equi-affine Plane
09:50–10:00	休息		
10:00–10:50	孙建国	姜 杨 (沈阳师范大学)	Extrinsic flat surfaces along the curve on the surface in the unit three-sphere
10:50–11:20		李美炫 (东师博士生)	Pedal and contrapedal curve of lightlike curve in Minkowski 3-space
11:20–13:30	午休		
13:30–14:20	赵 昕	魏斯宁 (东北财经大学)	Conformal Perturbations of modified Novikov Operators and the Kastler-Kalau-Walze type theorem
14:20–15:10		马荣升 (燕山大学)	The \ast -Ricci operator in contact geometry
15:10–15:20	休息		
15:20–16:20	李彦霖	谷世杰 (东北大学)	Compactifications of manifolds
闭幕式			

报告信息

杜荣 华东师范大学

Pinched theorem for compact Kahler-Einstein manifolds

For a compact Kahler-Einstein manifold M , I write an expression of Chern numbers in the form of certain integral on the holomorphic sectional curvature and its average at a fixed point using invariant theory. As an application, I can improve the classical $1/4$ -pinched theorem and negative $1/4$ -pinched theorem to smaller pinching constant depending only on the dimension and the first Chern class of M .

报告人简介: 杜荣, 博士毕业于美国伊利诺伊大学, 研究方向为代数几何和复几何; 现为华东师范大学数学科学学院教授、博导; 在 Math. Z.、Pacific J. Math.、J. Diff. Geom.、Ann. Mat. Pura Appl.、Asian J. Math. 等高水平杂志上发表 20 余篇论文; 主持面上项目等多项国家自然科学基金委项目。

王咏乔 大连海事大学

Envelopes created by circle families and pseudo circle families in the plane

In this talk, we give the definition of a modified envelope for a circle family in Euclidean plane and show a new method for calculating the modified envelope. Moreover, the relationships between the modified envelopes and some special curves are presented. Since there are three kinds of pseudo circles in Minkowski plane, we also consider the envelopes of pseudo circle families in Minkowski plane.

报告人简介: 王咏乔, 大连海事大学副教授, 2017 年博士毕业, 获北海道大学和东北师范大学双博士学位, 主持国家自然科学基金青年项目和辽宁省教育厅科技项目等。在 J. Geom. Phys., J. Singul., J. Geom., Appl. Anal., Int. J. Geom. 等期刊发表论文多篇。主要研究兴趣是奇点理论及其应用。

李强 齐齐哈尔大学

Bifurcation Model for Euler Buckling problem with Neumann BVP

In this talk, the bifurcation model for a nonlinear equation is introduced. Under the non-degeneracy condition, the bifurcation model describes the bifurcation of solutions to the nonlinear equation. We also show how these models work for Neumann problem on the square.

报告人简介: 李强, 男, 齐齐哈尔大学副教授, 硕士研究生导师, 东北师范大学数学与统计学院博士, 吉林大学数学学院博士后, 黑龙江省课程思政教学团队负责人。

责人，齐齐哈尔市高层次人才，研究方向为奇点理论、非线性分析，发表科研论文 30 余篇。

于海波（博士生） 东北师范大学

**Focal surfaces and evolutes of framed curves in the Riemannian 3-space form
from the viewpoint of Legendrian duality**

A framed curve, which may have singularities, in the Riemannian 3-space form is a curve with a moving frame. By using the moving frame, the focal surfaces and evolutes of framed curves in non-flat Riemannian 3-space form can be defined from the viewpoint of Legendrian duality. To investigate the local geometric properties of singular points of framed curves, we study singularities of focal surfaces and evolutes. Furthermore, the dual surfaces of evolutes of framed curves are given. According to the research of singularities of dual surfaces of evolutes, we describe the properties of the dualities of singularities.

刘海明 牡丹江师范学院

Cuspidal beak of de Sitter surface for timelike curve in Minkowski space-time

In this talk, we consider the singularities of de Sitter surface for timelike curve in timelike hypersurface embedded in R_1^4 . We find that the diffeomorphism types of the de Sitter surface are cuspidal edge, swallowtail and cuspidal beak. This is a joint work with Wanzhen Li.

报告人简介：刘海明，男，2015 年毕业于东北师范大学，获理学博士学位，现任牡丹江师范学院数学科学学院基础数学二级学科带头人，副教授，硕士研究生导师，黑龙江省普通本科高校青年创新人才。研究方向为奇点理论、微分几何，主持中央财政支持地方高校发展资金优秀青年人才项目，黑龙江省自然科学基金、黑龙江省教改项目等项目，在《中国科学：数学》、《Siberian Mathematical Journal》、《Journal of Geometry and Physics》、《Journal of Nonlinear Mathematical Physics》、《International Journal of Geometric Methods in Modern Physics》等期刊发表论文 30 余篇，多次为《AIMS Mathematics》、《Open Mathematics》、《International Electronic Journal of Geometry》等期刊审稿。

赵昕 青岛大学

**Pedal and contrapedal curves of mixed-type curves
in the Lorentz-Minkowski plane**

In this talk, we will discuss when the pedal and contrapedal curves of a mixed-type curve in the Lorentz-Minkowski plane can be defined and give the definitions of them when they exist. Then we will give properties of the pedal and contrapedal curves.

Moreover, we will introduce the relationship between the pedal curves and contrapedal curves, as well as the relationship among them and the evolute of a mixed-type curve.

报告人简介: 赵昕, 青岛大学数学与统计学院讲师。本硕博均就读于东北师范大学, 2022 年 6 月获理学博士学位, 主要研究方向为奇点理论和微分几何, 研究成果发表在 *Int. J. Geom. Methods Mod. Phys.*, *Acta Math. Sin. (Engl. Ser.)* 等期刊上。

李则雯 (博士生) 东北师范大学

Framed Isophote Curves on the Framed Surface

The isophote curve on surfaces is an important consequence of Lambert reflect law in optical research. In this talk, we define the framed isophote curve along a surface which original curve and surface may be singular. We give a condition of the framed isophote curve, and the expression of the light vector with different conditions. The relationship between the framed isophote curve and the framed helix is expounded. Moreover, we get the relationship between the framed isophote curve and the framed slant helix. Finally, we give the theorem for singularities recognition of framed isophote curves and two examples.

李彦霖 杭州师范大学

Developable surfaces and their singularities

Developable surfaces, which are isometric to the plane, in Euclidean 3-space are roughly classified into cylinders, cones and tangent developables. Developable surfaces may appear singularities in general. In this talk, I will speak on singularities of developable surfaces from the following three aspects:

Firstly, I would like to talk about the singularities of tangent developables. A tangent developable is ruled by tangent lines to a space curve and has singularities at least along the space curve, the edge of regression. In this part, the theory of finite determinacy will be introduced. It is usually the primary method to study the singularities of tangent developables. Furthermore, I will discuss the singularities of tangent developables and darboux developables of framed curves in Euclidean 3-space and the lightlike tangent developables in de Sitter 3-space. Several interesting questions regarding tangent developables also will be presented in this part.

Secondly, I will present the quasi-frame of space curve in Euclidean 3-space. The quasi-frame is constructed based on the Bishop frame, it has the virtue of calculation compared with the Bishop frame. I will show two new kinds of developable surfaces

generated by the quasi-frame of space curve in Euclidean 3-space. One kind is directional developable surface, and the other one is the quasi-normal developable surface. To study the singularities of such developable surfaces, I introduce two new invariants of the curve to characterize these singularities and classify the type of directional developable surface and quasi-normal developable surface. Furthermore, I will talk about Bruce's singularity theory to give the classification of singularities of these developable surfaces.

Finally, I am going to speak on the developable surfaces with pointwise 1-type Gauss map of Frenet-type framed base (Ftfb) curve in Euclidean 3-space. I will talk about tangent developable surfaces, focal developable surfaces, and rectifying developable surfaces with singular points in this part. I will show the conditions for the Gauss map of these surfaces to be pointwise 1-type separately.

李彦霖，毕业于东北师范大学，现工作于杭州师范大学。主要研究领域是奇点理论及其应用，特别地，对奇异子流形的几何与拓扑性质尤为关切。

姚凯鑫（博士生） 东北师范大学

Pedal and contrapedal curves of non-lightlike framed curves in Minkowski 3-space

In this talk, we define the non-lightlike framed curves in Minkowski 3-space, which can have singularities, and give the existence and uniqueness theorem of the non-lightlike framed curves. We also define the evolutes, pedal and contrapedal curves of non-lightlike framed curves and discuss their properties.

许博源（博士生） 东北师范大学

Lightlike Curve with Singularities in Minkowski 3-space

In this talk, we define a special lightlike curve, which can have singularities, and give three Frenet-type frames, which is moving frame, adapt frame and cartan-type frame. By using cartan-type frame, we present some results calculated recently.

孙建国 中国石油大学（华东）

几类特殊曲线的微分几何性质研究

曲线是微分几何的主要研究对象之一，随着人们对曲线理论越来越感兴趣，特殊曲线的研究也在不断发展。本报告主要就奇点理论视角下对几类特殊曲线（Killing magnetic curves、Smarandache curves etc.）的局部几何性质进行研究，得到曲线间几何不变量之间的联系与由几何不变量所反映的曲线的几何性质。

报告人简介: 孙建国 男 中国石油大学(华东)理学院副教授, 近五年主持国家自然科学基金青年 1 项, 山东省自然科学基金面上和青年各 1 项, 校科研基金 2 项, 发表科研论文 20 余篇; 2020 年获得山东省青年教师讲课比赛一等奖第一名, 2022 年获得山东省首届课程思政教学比赛三等奖, 主持山东省教学改革项目 1 项, 校教学改革项目 2 项, 山东省一流课程《高等数学》主要负责人, 主编“十四五”规划教材 2 部, 发表教学论文 5 篇。

张姝玥(博士生) 东北师范大学

Pedal and Contrapedal Curves in Equi-affine Plane

We define equi-affine pedal and contrapedal curves in equi-affine plane. We also consider the relationships among equi-affine evolutes, involutes, parallels, pedal and contrapedal curves. In conclusion, we investigate the classifications of singularities of equi-affine pedal and contrapedal curves.

姜杨 沈阳师范大学

Extrinsic flat surfaces along the curve on the surface in the unit three-sphere

In this paper, we consider curves on the surface in the unit 3-sphere. For a regular curve on a surface in the unit 3-sphere, we have a moving frame along the curve which is called a spherical Darboux frame. We induce two special vector fields along the curve with respect to the spherical Darboux frame and investigate the singularities of extrinsic flat great circular surfaces associated to these vector fields.

报告人简介: 姜杨, 沈阳师范大学, 副教授, 研究领域为微分几何, 非欧空间的奇点理论, 代数学等。代表性成果曾发表在 The Quarterly Journal of Mathematics, Mathematische Nachrichten, Journal of Mathematical Physics 等杂志上。曾主持国家自然科学基金天元青年基金项目, 辽宁省自然科学基金面上项目等。

李美炫(博士生) 东北师范大学

Pedal and contrapedal curve of lightlike curve in Minkowski 3-space

In this talk, we use Cartan frame to define the pedal and contrapedal curves of regular lightlike curves in Lorentz-Minkowski 3-space. Then we analyse geometric properties of them and establish their relationships to evolute of lightlike curve. Moreover, we give the recognition theorem of singular points of lightlike pedal and contrapedal curves as main theorem.

魏斯宁 东北财经大学

Conformal Perturbations of modified Novikov Operators and the Kastler-Kalau-Walze type theorem

In this talk, we obtain two Kastler-Kalau-Walze type theorems for conformal perturbations of modified Novikov Operators on four-dimensional and six-dimensional compact manifolds with (respectively without) boundary.

报告人简介: 东北财经大学讲师, 2021年毕业于东北师范大学, 获理学博士学位, 主要研究领域为整体微分几何, 研究成果发表在 *Topology Appl.*, *Int. J. Geom. Methods Mod. Phys.* 等期刊上。

马荣升 燕山大学

The \ast -Ricci operator in contact geometry

Contact geometry is the corresponding geometry of symplectic geometry in odd dimension. Its basic research objects are contact metric manifolds. In this talk, we investigate the \ast -Ricci operator and \ast -Ricci tensor on almost contact metric manifolds. We give the definition of Reeb flow invariant \ast -Ricci operator and its application on almost contact metric manifolds.

报告人简介: 马荣升, 燕山大学理学院讲师。本科毕业于北京科技大学, 硕博毕业于东北师范大学。2022年6月获理学博士学位。主要研究研究方向为黎曼几何与切触几何。研究成果发表在 *Math. Slovaca* 等期刊上。

谷世杰 东北大学

Compactifications of manifolds

In 1966, Larry Siebenmann once mused that his work (PhD thesis) was initiated at a time "when 'respectable' geometric topology was necessarily compact". That attitude has long since faded; today's topological landscape is filled with research in which noncompact spaces are primary objects. However, major successes in understanding and compactifying manifolds included here are fundamental to manifold topology and geometric group theory: Stallings's characterization of Euclidean spaces, Siebenmann's collaring theorem and our recent Gu-Guilbault's manifold completion theorem. In the first part, I will provide a quick access to some of those results by weaving them together with common interpretations. In the second part, I will introduce several long-standing open questions on this topic. In particular, the implications between pseudo-collarability and Z -compactifiability, two main extensions on the manifold completion theorem, are not clear. Using the interaction of hypoabelian groups and

knot theory, I will construct counterexamples to the statement that Z -compactifiability implies pseudo-collarability.

报告人简介：谷世杰，东北大学数学系教授。2018 年于美国威斯康星大学密尔沃基分校获博士学位。主要研究几何拓扑中的流形的拓扑与 wild topology。

东北师范大学：1945年10月25日，毛泽东主席接见延安大学校院主要领导干部，指示学校向东北迁移，创办“新型的东北大学”。1946年2月东北大学在本溪建校，是中国共产党在东北地区创建的第一所综合性大学。1949年7月定址于长春。1950年4月更名为东北师范大学。1996年9月成为首批国家“211工程”重点建设大学。2004年6月经教育部批准设立研究生院。2007年，入选国家教师教育“985工程”优势学科创新平台建设高校。2017年9月，入选国家“双一流”建设高校。

学校现有自由校区和净月校区。全日制在校学生 26997 人，专任教师 1671 人，其中教授 511 人，副教授 645 人。学校设有 22 个学院（部），81 个本科专业，23 个博士学位授权一级学科，37 个硕士学位授权一级学科，1 个博士专业学位授权点和 22 个硕士专业学位授权点，以及 22 个博士后科研流动站。学科点覆盖了除军事学和医学以外的 11 个学科门类，形成了层次分明、类型多样的人才培养体系。

数学与统计学院：创建于 1948 年，其前身为东北师范大学数学系，2004 年 1 月撤系建院。2009 年 9 月，经过调整，学院下设基础数学系、信息与计算科学系、统计系、应用数学系、运筹与控制系、数学教育系、金融与信息工程研究中心、应用数学研究所、统计咨询中心，建有应用统计教育部重点实验室。

数学与统计学院主要的稳定研究方向有统计学及其应用、偏微分方程与系统控制、常微分方程、拓扑学、李代数、课程与教学论等。近 5 年数学与统计学院共承担“211 工程”三期重点学科建设项目，国家科技部 973 项目，自然科学基金委重点项目、杰出青年基金项目、面上项目，教育部新世纪人才培养计划和其它省部级项目 70 余项。学院教师每年在重点学术期刊上发表论文 100 余篇，其中 SCI 检索 80 篇以上。近年来荣获国家自然科学二等奖 1 项、教育部自然科学奖一等奖 1 项、二等奖 3 项，国家统计局全国统计科学技术进步一等奖 1 项，国家教育委员会二等奖 1 项、三等奖 3 项，中国教育学会二等奖 1 项，钟家庆数学奖 1 项。学院教师多人获得宝钢优秀教师奖，1 人被人事部和教育部联合授予“全国模范教师”称号。其它省部级奖励多项。

长风万里度，虚怀凤来仪，东北师范大学数学与统计学院诚邀英才与知己！