2021复旦-科大谱几何会议

Workshop on Spectral Geometry

会议手册

2021 年 12 月 6 日-8 日

目 录

一、会议简介

会议时间：2021 年 12 月 6 日——2021 年 12 月 8 日

上午 8:30-11:15，下午 14:00-16:45

会议地点：腾讯会议在线

12 月 6 日-会议 ID：829 288 537

12 月 7 日-会议 ID：823 204 574

12 月 8 日-会议 ID：461 956 127

会议密码发邮件给 zhouk@fudan.edu.cn 获取

报告人（按姓氏首字母排列）：

陈大广　　清华大学

陈化　　　武汉大学

陈曦　　　复旦大学上海数学中心

葛建全　　北京师范大学

韩邦先　　中国科学技术大学

黄耿耿　　复旦大学

金龙　　　清华大学

林辉球　　华东理工大学

林勇　　　清华大学

麻希南　　中国科学技术大学

毛井　　　湖北大学

王芳　　　上海交通大学

王奎　　　苏州大学

吴云辉　　清华大学

夏超　　　厦门大学

杨孝平　　南京大学

周家足　　西南大学

朱萌　　　华东师范大学

组织者：

王作勤　　中国科学技术大学

华波波　　复旦大学

主办单位： 中国科学技术大学，复旦大学

二、会议时间安排表

	12 月 6 日	主持人
上午 8:30-9:15	陈化	陆志勤
9:30-10:15	吴云辉	
10:30-11:15	王奎	
下午 14:00-14:45	麻希南	徐国义
15:00-15:45	王芳	
16:00-16:45	朱萌	

	12 月 7 日	主持人
上午 8:30-9:15	林勇	刘世平
9:30-10:15	金龙	
10:30-11:15	陈曦	
下午 14:00-14:45	葛建全	彦文娇
15:00-15:45	林辉球	
16:00-16:45	夏超	

	12 月 8 日	主持人
上午 8:30-9:15	杨孝平	楼元
9:30-10:15	陈大广	
10:30-11:15	毛井	
下午 14:00-14:45	黄耿耿	来米加
15:00-15:45	韩邦先	
16:00-16:45	周家足	

三、报告信息

报告题目：Upper bound estimates of eigenvalues for Hormander operators on non-equiregular sub-Riemannian manifolds

报告人：陈化

报告人所在单位：武汉大学

报告摘要：In this talk, we report some recent results on eigenvalue problem for self-adjoint Hormander operators on non-equiregular sub-Riemannian manifolds. By Rayleigh-Ritz formula and the subelliptic heat kernel estimates, we establish the upper bounds of eigenvalues which depend on the volume of subunit ball and the measure of the manifold. Under a certain condition, we obtain the explicit upper bounds of eigenvalues which have the polynomially growth in k with the optimal order related to the non-isotropic dimension of the manifold.

报告题目：Recent progress on first eigenvalues of hyperbolic surfaces for large genus

报告人：吴云辉

报告人所在单位：清华大学

报告摘要：In this talk we will discuss several recent results on first eigenvalues of closed hyperbolic surfaces for large genus. For example, we show that a random hyperbolic surface of large genus has first eigenvalue greater than $\frac{3}{16}-\epsilon$, extending Mirzakhani's lower bound 0.0024. This talk is based on several joint works with Yuhao Xue.

报告题目：Lower bounds for the first eigenvalue on Kahler manifolds

报告人：王奎

报告人所在单位：苏州大学

报告摘要：In this talk, we will present lower bounds for the first nonzero eigenvalue of the Laplacian on closed Kahler manifolds and compact Kahler manifolds with Dirichlet and Neumann boundary, in terms of dimension, diameter, and lower bounds of holomorphic sectional curvature and orthogonal Ricci curvature. This is a joint work with Xiaolong Li (Wichita State University).

报告题目：Liouville theorem for a class semilinear elliptic equation on Heisenberg group

报告人：麻希南

报告人所在单位：中国科学技术大学

报告摘要：We obtain a Liouville type theorem to the classical semilinear subcritical elliptic equation on Heisenberg group. The soul of the proof is an a priori integral estimate, which is deduced from a generalized differential identity found by Jerison and Lee in 1988. This is joint work with Qianzhong OU.

报告题目：The relative volume of Poincare-Einstein manifolds

报告人：王芳

报告人所在单位：上海交通大学

报告摘要：For a Poincare-Einstein manifold, the Bishop-Gromov comparison theorem tells us that the relative volume is a non-increasing function of the geodesic radius. In this talk, I will show that the fractional Yamabe constant at the conformal infinity provides a lower bound for this function. As an application, this implies a gap phenomena and the rigidity theorem.

报告题目：Eigenvalue and heat kernel estimates on the canonical bundle of Kaehler manifolds

报告人：朱萌

报告人所在单位：华东师范大学

报告摘要：Let M be an m dimensional closed Kaehler manifold. We will present certain eigenvalue and heat kernel estimates for the Hodge Laplacian acting on smooth sections of the canonical bundle of M, i.e., (m,0)-forms. The main results only rely on the bound of the Ricci curvature, and the volume and diameter of M, instead of the bound of the whole curvature tensor for general differential forms. This is a joint work with Zhiqin Lu and Qi S. Zhang.

报告题目：Heat kernel and Green function on subgraphs of a complete graph

报告人：林勇

报告人所在单位：清华大学

报告摘要：We derive expression for the subgraph heat kernel and compute the coefficients of the expansion.By using the heat kernel expansions for the Laplacian on a subgraph of a complete graph, we obtain formal expansions for the Green function of the Laplacian. This is a joint work with Ngai and Yau.

报告题目：Control of eigenfunctions on surfaces of negative curvature

报告人：金龙

报告人所在单位：清华大学

报告摘要：In this talk, we present a uniform lower bound for the mass in any fixed nonempty open set of normalized Laplacian eigenfunctions on negatively curved

surfaces, independent of eigenvalues. The result extends previous joint work with Semyon Dyatlov on surfaces with constant negative curvature. The proof relies on microlocal analysis, chaotic behavior of the geodesic flow and a new ingredient from harmonic analysis called Fractal Uncertainty Principle by Jean Bourgain and Semyon Dyatlov. Further applications include control for Schrödinger Equation and exponential decay of energy for damped waves. This is based on joint work with Semyon Dyatlov and Stéphane Nonnenmacher.

报告题目：双曲空间上拉普拉斯算子的一致索伯列夫估计和薛定谔算子特征值估计

报告人：陈曦

报告人所在单位：复旦大学上海数学中心

报告摘要：作为经典的索伯列夫不等式的推广，Kenig-Ruiz-Sogge 建立了欧氏空间上拉普拉斯算子在谱附近的(p,q)-型一致索伯列夫估计，其中对偶型指标(p,p')和傅里叶变换限制性定理有着深刻的联系。特别地，由著名的 Knapp 反例，指标 p 不能接近于 2，而与 Stein-Tomas 球面限制性定理相一致。进一步，由 Frank-Simon 的系列工作，一致索伯列夫估计可以给出带复位势的薛定谔算子特征值上界估计。 在双曲空间中，函数卷积满足 Kunze-Stein 现象，这一非欧式性质使得双曲空间中的一致索伯列夫估计的指标 p 可以任意接近 2，从而衍生出更精确的薛定谔算子特征值估计。

报告题目：The volume gap for minimal submanifolds in spheres

报告人：葛建全

报告人所在单位：北京师范大学

报告摘要：We show there is a volume gap for nonembedded closed minimal submanifolds in spheres, generalizing Li-Yau's result from 2 dimension to arbitrary

dimension and in particular, proving the Solomon-Yau conjecture for nonembedded case. Besides, for certain minimal CSC hypersurfaces, we also obtain some volume gap results, improving the general gap of Cheng-Li-Yau in these special cases.

报告题目：Bounds on the spectral radius of graphs

报告人：林辉球

报告人所在单位：华东理工大学

报告摘要：In this talk, we report results and open problems on the upper bounds of the spectral radii of graphs.

报告题目：Stability of capillary hypersurfaces and the second Robin eigenvalue

报告人：夏超

报告人所在单位：厦门大学

报告摘要：In this talk, we study stability of capillary hypersurfaces. We prove that a capillary hypersurface in a geodesic ball in space forms or a horoball in hyperbolic space is stable if and only if it is umbilical. In particular, the relationship between the stability problem and the estimate for the second Robin eigenvalue of the Jacobi operator will be mentioned. This is based on the joint work with Jinyu Guo and Guofang Wang.

报告题目：Some Properties of Solutions to Biased Infinity Laplacian Equations

报告人：杨孝平

报告人所在单位：南京大学

报告摘要：In this talk, we will discuss a kind of infinity Laplacian equations arising from the biased tug-of-war in random games. Various properties of the solutions for such equations, including the gradient estimates, the Harnack inequalities for both nonnegative u and |*Du*|, the principal eigenvalue are established. We will also prove some existence and uniqueness results of eigenfunctions for the principal eigenvalue.

报告题目：Talenti's comparison theorem for Poisson equation and applications on Riemannian manifold with nonnegative Ricci curvature

报告人：陈大广

报告人所在单位：清华大学

报告摘要：In this talk, we will report Talenti's comparison theorem for Poisson equation on complete noncompact Riemannian manifold with nonnegative Ricci curvature. We will show how to use Talenti's comparison result to prove the Faber-Krahn inequality for the first eigenvalue of Dirichlet Laplacian, L^1- and L^∞-moment spectrum, especially Saint-Venant theorem for torsional rigidity and a reverse Hölder inequality for eigenfunctions of Dirichlet Laplacian. This is the joint work with Professor Haizhong Li.

报告题目：Estimates for sums of eigenvalues of the free plate with nonzero Poisson's ratio

报告人：毛井

报告人所在单位：湖北大学

报告摘要：By using the Fourier transform, we successfully give Kröger-type estimates for sums of eigenvalues of the free plate (under tension and with nonzero Poisson's ratio) in terms of the dimension of the ambient space, the volume of the

domain, the tension parameter and the Poisson's ratio. This talk is based on a joint-work with Ms. Shan Li.

报告题目：Regularity of free boundary for the Monge-Ampere obstacle problem

报告人：黄耿耿

报告人所在单位：复旦大学

报告摘要：

In this talk, we talk about the regularity of the free boundary in the Monge-Ampère obstacle problem

$$\det D^2 v = f(y)\chi_{\{v>0\}}, \quad \text{in} \quad \Omega$$
$$v = v_0, \quad \text{on} \quad \partial\Omega.$$

Assume that Ω is a bounded convex domain in $\mathbb{R}^n$, and $f, v_0 > 0$. Then $\Gamma = \partial\{v = 0\}$ is smooth if f is smooth; and Γ is analytic if f is analytic. This is a joint work with Prof. Tang Lan and Prof. Wang Xu-Jia.

报告题目：Cheeger constant, spectrum and volume entropy on metric measure spaces with non-negative Ricci curvature

报告人：韩邦先

报告人所在单位：中国科学技术大学

报告摘要：We prove a sharp dimension-free isoperimetric inequality, involving the volume entropy, in non-compact metric measure spaces with non-negative synthetic Ricci curvature. For spaces which admit a needle disintegration, we show that the sharp isoperimetric inequality is achieved only when a 1-dimensional space with density e^{-t} is split off. All the results are proved in the non-smooth framework, but new even in smooth metric measure spaces.

报告题目：Quemassintegrales and Geometric measures

报告人：周家足

报告人所在单位：西南大学

报告摘要：We will investigate the geometric measure on set of convex bodies. The late researches indicate those geometric measures are closely related to quemassintegrales of convex bodies and mean curvature integrals. More isoperimetric inequalities for geometric measures will be introduced. The talk is based on joint works with N. Fang, W. Xu and B. Zhu.