首都师范大学数学科学学院 School of Mathematical Sciences Capital Normal University

交叉科学研究院 ACADEMY FOR MULTIDISCIPLINARY STUDIES

首都师范大学 2021 年算术几何暑期学校

会议手册

首都师范大学数学科学学院、交叉科学研究院

北京成像理论与技术高精尖创新中心

光场成像与数字几何北京市重点实验室

2021 年 7 月 3-10 日　北京

短课程简表						
地点：校本部教二楼 827 腾讯会议 ID: 375 9554 1933　会议密码：6890						
日期/时间	7 月 3 日 (周六)	7 月 4 日 (周日)	7 月 5 日 (周一)	7 月 6 日 (周二)	7 月 7 日 (周三)	7 月 8 日 (周四)
9:00-11:00	张磊	张超	曹阳	曹阳	张磊	曹阳 （8：30-11：30）
14:00-16:00	张超	张磊	张超	张磊	张超	研究生学术论坛

短课程介绍

Fundamental Groups in Algebraic Geometry

张磊

香港中文大学

Lecture 1. The geometrization of the Galois Theory (45min - 1h)
In this lecture, we'll give a general picture of how fundamental groups come up in algebraic geometry.

Lecture 2. Morphisms of Schemes I (45min -1h)
In this lecture, we will study/review finite/quasi-finite morphisms of schemes.

Lecture 3. Morphisms of Schemes II (45min - 1h)
In this lecture, we will study/review flat morphisms of schemes.

Lecture 4. Étale morphisms and Étale Covers (45min -1h)
In this lecture, we'll study extensively a very special and very beautiful kind of morphisms of schemes, namely the étale morphisms. Then we will introduce the category of finite étale covers.

Lecture 5. Galois Categories and the Étale Fundamental Group (45min-1h)

In this lecture, we'll follow Grothendieck's beautiful construction of the étale fundamental group using Galois categories.

Lecture 6. First Properties of the Étale Fundamental Group (45min-1h)

In this lecture, we'll introduce some basic properties of the étale fundamental group, e.g. the choice of the base point, the homotopy exact sequence, etc..

Lecture 7. A Brief Introduction to the Nori Fundamental Group (45min-1h)

In this lecture, we'll give a brief introduction to the Nori Fundamental Group which can be seen as an attempt of adding "purely inseparable covers" to the category of étale covers.

Lecture 8. Other Fundamental Groups in Algebraic Geometry (45min-1h)

In this lecture, we'll give a very brief sketch of how to use a general machinery - Tannakian Duality, which is developed by Grothendieck-Saavedra-Deligne, to produce many kinds of fundamental groups in algebraic geometry.

志村簇及其约化理论选讲

张超

东南大学丘成桐中心

内容简介：本课程的主要目的，是介绍 Hodge 型志村簇的好约化理论，并探讨其特殊纤维的若干性质。具体的，我们会介绍志村簇的一般概念与理论，并基于阿贝尔簇的模空间来介绍 Kisin 建立的 Hodge 型志村簇的整典范模型。接下来，我们会介绍其特殊纤维的 Ekedahl-Oort 层次理论，并基于此解释以下内容：

（1）Goldring-Koskivirta 的 Hasse 不变量理论，以及其算术应用（Invent. Math. 2019）

（2）F. Andreatta 关于 mod p 周期映射的结果（arXiv:2103.12361）

我们会假设听众熟悉代数几何的基本知识。我们不会假设听众已熟知代数群和阿贝尔簇的相关结果----这些对理解本课程是有帮助的，我们会依实际需要补充相关内容。

局部整体原则和 Brauer-Manin 障碍

曹阳

中国科学技术大学

1，局部整体原则（Hasse 原则）和弱逼近的定义、例子、双有理不变性；代数簇上的 adele 拓扑。

2，Brauer-Manin 障碍的定义、例子和猜想。

3，代数群和齐性空间。

4，更精细的上同调障碍。

会议报告安排

地点：金龙潭大酒店

腾讯会议 ID: 375 9554 1933　会议密码：6890

7 月 9 日上午（三层第一会议室）			主持
09:00-10:00	魏达盛 中科院数学与系统科学研究院	Rational points on fibration with few non-split fibers	徐飞 首都师范大学
10:30-11:30	赵以庚 西湖大学	Twist formulas for epsilon factors	
11:30-13:30	休息		
7 月 9 日下午（三层第一会议室）			**主持**
13:30-14:30	盛茂 中国科学技术大学	Tensor product theorem for semistable parabolic λ-connections	方江学 首都师范大学
15:00-16:00	王宇鹏 中科院晨兴数学中心	A p-adic Simpson correspondence: semi-stable reduction case	
7 月 10 日上午（三层弘翔 A 厅）			**主持**
09:00-10:00	申旭 中科院晨兴数学中心	Diamonds and p-adic period domains	唐舜 首都师范大学
10:30-11:30	赵斌 中科院晨兴数学中心	Refined spectral halo for eigencurves	
11:30-13:30	休息		
7 月 10 日下午（三层弘翔 A 厅）			**主持**
13:30-14:30	谭福成 日本京都数理研究所	The fundamental groups in geometry and arithmetic	童纪龙 首都师范大学
15:00-16:00	阳煜 日本京都数理研究所	Anabelian geometry of curves via moduli spaces of fundamental groups	
16:00	会议结束		

会议报告摘要

Rational points on fibration with few non-split fibers

魏达盛

中国科学院数学与系统科学研究院

Let $f: X \to P^1$ be a dominant map whose generic fibre is rationally connected. Assume that the Brauer-Manin obstruction controls Hasse principle and weak approximation for rational points on all (or most) smooth fibers. A natural question is whether the same holds for the whole space X. With some assumptions, we will try to answer this question and give some applications. This is a joint work with Harpaz and Wittenberg.

Twist formulas for epsilon factors

赵以庚

西湖大学

Epsilon factors are the constant terms in the functional equations of L-functions, which contain the ramification information. In this talk, we will first review the classical epsilon factors in number theory, then study some twist formulas of their generalizations in the theory of l-adic sheaves. This is joint work with Enlin Yang.

Tensor product theorem for semistable parabolic λ-connections

盛茂

中国科学技术大学

Let X be a smooth complex projective variety and $D \subseteq X$ a reduced effecitve normal crossing divisor. Fix an ample line bundle L over X. We prove that the tensor product of μ_L-semistable parabolic λ-connections over (X, D) is again μ_L-semistable. For empty D and integrable λ-connections, the existed proof is transcendental. Our method is first establishing a tensor product theorem in positive characteristic and then taking reduction at a good prime p. This is a joint work with Jianping Wang.

A p-adic Simpson correspondence: semi-stable reduction case

王宇鹏

中国科学院晨兴数学中心

In the talk, I will give a p-adic Simpson correspondence for rigid analytic varieties over $\mathbb{C}_p$ with liftable semi-stable reductions. This is a joint work with Mao Sheng.

Diamonds and p-adic period domains

申旭

中国科学院晨兴数学中心

In this talk, we will investigate the geometry of some diamonds, namely the B_{dR}^{+}-affine Schubert varieties, via the Fargues-Fontaine curve and Harder-Narasimhan formalism. Along the way, the theory of p-adic period domains arises naturally. We will discuss the structure of certain generalized p-adic period domains.

Refined spectral halo for eigencurves

赵斌

中国科学院晨兴数学中心

It was conjecture by Coleman-Mazur-Buzzard-Kilford that over the boundary annuli of the weight space, the eigencurve decomposes into disjoint union of subspaces that are finite and flat over the weight space. Most parts of this conjecture have been verified by previous work of Liu-Wan-Xiao and Ren-Zhao. In this talk, I will explain a joint work in progress with Yongquan Hu and Liang Xiao towards a refined version of Coleman-Mazur-Buzzard-Kilford conjecture. As an application, we are able to determine the p-adic slopes of all the crystabelline lift of a (local) reducible mod p Galois representation. If time allows, I will explain how to handle the irreducible representations.

The fundamental groups in geometry and arithmetic

谭福成

日本京都数理研究所

After recalling some basics in etale fundamental groups, we shall explain Grothendieck's anabelian problems. The results in this direction include the theorems of Neukirch and Uchida from the 1970's and the work of Tamagawa and Mochizuki in the 1990's. Roughly speaking, these results show that the etale fundamental groups of global fields and hyperbolic curves determine the field/scheme structures. In fact, Uchida's method provides an algorithm for the construction of the scheme structures, in many cases. This kind of constructability is part of Grothendieck's original proposal. Moreover, we introduce the motivic fundamental groups and their applications to arithmetic, such as Kim's proof of Siegel's theorem and the results on the Deligne-Ihara conjecture of Brown and Deligne.

Anabelian geometry of curves via moduli spaces of fundamental groups

阳煜

日本京都数理研究所

In this talk, I would like to explain the theory of the anabelian geometry of curves over algebraically closed fields of positive characteristics. Firstly, I will explain the previous form of this theory developed by Prof. Akio Tamagawa and a new kind of anabelian phenomenon observed by the speaker that cannot be explained by using Grothendieck's original anabelian philosophy. Secondly, I will explain a new form of this theory via the so-called moduli spaces of admissible fundamental groups established by the

speaker.

附件：金龙潭大饭店位置介绍

酒店地址：

北京市海淀区西三环北路 71 号（紧邻地铁 6 号线花园桥站）

酒店位置介绍：

酒店与首都师范大学仅咫尺之遥，交通便利，向南步行可达北一区和校本部。

- 紧邻地铁 6 号线花园桥站 A 出口约 800 米；
- 距离首都国际机场 36 公里，乘坐出租车约 55-60 分钟；
- 距离北京南站 18 公里，乘坐出租车约 30 分钟；
- 距离北京站 15 公里，乘坐出租车约 30 分钟；
- 距离北京西客站 8 公里，乘坐出租车约 20 分钟。