Arithmetic Geometry in Shenzhen II

Handbook Last updated: December 3, 2025

Contents

1 General info

Para 1.1 (**General info of conference**)**.**

- Conference Time: Nov. 24–28, 2025.
- Place: M1001, located on 1st Floor of College of Science Building.
- Organizers: Ziquan Yang (CUHK), Qing Xiang (SUSTech), Tong Liu (Purdue), Shizhang Li (MCM), Stavros Garoufalidis (SUSTech), Hui Gao (SUSTech)
- Website: https://huigaomath.github.io/events/2025/2025-arithgeom-shenzhen.html

Para 1.2. Conference secretary/assistants

When contacting the secretaries/assistants, please feel free to cc:
Hui Gao: mathnature@gmail.com

- Ms. Min Zhang (English name: Mia) conference secretary.
  (in charge of reimbursement, invitation letter, entry to univ).
  email: zhangm7@mail.sustech.edu.cn

- Ms. Jie Sheng
  in charge of hotel
  shengj@mail.sustech.edu.cn
- Mr. Shenrong Wang: postdoc, conf assistant.
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- Mr. Yimeng Tang: student, conf assistant.
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2 Schedule

Place: M1001, located on 1st Floor of College of Science Building.
(All in person talk; no video recording).

Time	Nov 24 (Mon.)	Nov 25	Nov 26	Nov 27	Nov 28 (Fri.)
09:25–09:30	opening				
09:30–10:30	Wiesława Nizioł	Ferdinand Wagner	Grigory Andreychev	Ian Gleason	Josh Lam
10:30–11:00	break	break	break	break	break
11:00–12:00	Pierre Colmez	Stavros Garoufalidis	Karol Koziol	Lucas Mann	Pol van Hoften
14:00–15:00	Sean Howe	Hansheng Diao	FREE DISCUSSION	Andreas Mihatsch	FREE DISCUSSION
15:00–15:45	break	break		break	
15:45–16:45	Finn Wiersig	Zijian Yao		Zhiyu Zhang	

Notes.

- A talk is usually 60min=55min+5min questions.
- Wifi: please use eduroam.

3 Title and Abstract

Nov 24, Monday

Title: Topological Vector Spaces
Speaker: Wiesława Nizioł
Abstract: The category of Banach-Colmez spaces embeds fully into the category of Vector Spaces (pro-étale $\mathbb{Q}_p$-sheaves) as well as into the category of Topological Vector Spaces (enriched topological presheaves). I will discuss these embeddings and the computation of the Ext-groups of Banach-Colmez spaces. This is based on a joint work with Pierre Colmez.

Title: A locally analytic approach to the p-adic local Langlands correspondence for $\mathrm{GL}_2(\mathbb{Q}_p)$
Speaker: Pierre Colmez
Abstract: I will explain how to construct the p-adic local Langlands correspondence for $\mathrm{GL}_2(\mathbb{Q}_p)$ starting from the locally analytic one, using (φ, Γ)-modules over the Robba ring. This is joint work with Joaquin Rodrigues Jacinto.

Title: Twistors and the $\mathbf{B}_{\mathrm{dR}}^+$-jet sheaf
Speaker: Sean Howe
Abstract: For S a smooth rigid analytic variety over a p-adic field, we explain how to construct a functor from $\mathbb{Q}_p$-local systems on S to twistors on the relative thickened Fargues-Fontaine curve over S. This can be viewed as a new comparison theorem in relative p-adic Hodge theory and has applications to the differential study of period maps. Our construction combines the Liu-Zhu Riemann-Hilbert correspondence with a geometrization of a part of the de Rham comparison theorem via the $\mathbf{B}_{\mathrm{dR}}^+$-jet sheaf — the latter is an interesting object on its own, and we pose some questions about it.

Title: A Reconstruction Theorem for coadmissible $\widehat{\mathcal{D}}$-modules
Speaker: Finn Wiersig
Abstract: Let X be a smooth rigid-analytic variety. Ardakov and Wadsley introduced the sheaf $\widehat{\mathcal{D}}$ of infinite order differential operators on X, along with the category of coadmissible $\widehat{\mathcal{D}}$-modules. In this talk, we present a Riemann–Hilbert correspondence for these coadmissible $\widehat{\mathcal{D}}$-modules. Specifically, we interpret a coadmissible $\widehat{\mathcal{D}}$-module as a p-adic differential equation, explain what it means to solve such an equation, and describe how to reconstruct the module from its solutions.

Nov 25 (Tuesday)

Title: Algebraic Habiro cohomology
Speaker: Ferdinand Wagner
Abstract: In their work on the Habiro ring of a number field, Garoufalidis-Scholze-Wheeler-Zagier explain how to construct a formally étale algebra over the Habiro ring for any étale extension of the integers. Moreover, they show that certain 3-manifold invariants take values in these rings. In this talk, I'll explain how to generalize their construction to smooth schemes of any dimension over the integers. Interestingly, the relation to 3-manifold topology seems to continue: In recent work, Garoufalidis and Wheeler have suggested constructions of explicit classes in algebraic Habiro cohomology, again starting from 3-manifold invariants.

Title: Habiro cohomology
Speaker: Stavros Garoufalidis
Abstract: We will report on experiments that lead to a new notion: Habiro cohomology, which is currently developed by Ferdinand Wagner, Peter Scholze, Campbell Wheeler and us. This new cohomology theory determines q-deRham, q-Hodge cohomology, and compares well with the prismatic cohomology of Bhatt-Scholze. Joint work with Campbell Wheeler.

Title: A p-adic monodromy theorem for curves
Speaker: Hansheng Diao
Abstract: We show that every de Rham p-adic local system on a smooth projective curve over a p-adic field becomes

semistable upon pullback to a finite cover of the curve. This result is a relative version of the classical p-adic monodromy theorem, which asserts that every de Rham representation is potentially semistable. This is a joint work with Heng Du, Yong Suk Moon, and Zijian Yao.

Title: p-adic Hyperbolicity for Shimura varieties and period images
Speaker: Zijian Yao
Abstract: The study of the geometry and arithmetic of Shimura varieties, and more generally, period domains, have had important applications in number theory and particularly in the Langlands program. A theorem of Borel from the 1970s says that any holomorphic map from a smooth complex algebraic variety to a Shimura variety is automatically an algebraic map. In this talk, I will discuss a p-adic analogue of this result both in the context of general Shimura varieties and for period domains. In particular, I will explain some inputs from the theory of prismatic cohomology. This is based on recent joint work with Ben Bakker, Abhishek Oswal, and Ananth Shankar.

Nov 26 (Wednesday)

Title: Stacky approach to Galois representations
Speaker: Grigory Andreychev
Abstract: In ongoing joint work with Maximilian Hauck and Tasos Moulinos, we investigate the étale realization functor from prismatic F-gauges to Galois representations of $\mathbb{Q}_p$ with coefficients in $\mathbb{Z}_p$; in the course of this study, we construct an analytic stack in the sense of Clausen–Scholze whose category of quasi-coherent sheaves, or to be more precisely, its category of perfect complexes, is equivalent to the bounded derived category of finitely generated Galois representations.

Title: Parahoric Ext-algebras and derived Satake morphisms in characteristic p
Speaker: Karol Koziol
Abstract: In recent years, there has been increased interest in understanding derived aspects of the mod p representation theory of p-adic reductive groups G, motivated by applications to the categorical Local Langlands program and moduli stacks of Galois representations. One hands-on method for making progress is to examine the structure of Hecke Ext algebras $E^*(G, J)$ relative to a compact open subgroup J of G. These are derived analogues of the more familiar Hecke algebras $H(G, J)$ over coefficient fields of characteristic p. In this talk, I'll present some of the structure theory of these algebras for various choices of J (Iwahori, hyperspecial, etc.). I'll also discuss the construction of derived Satake morphisms which relate $E^*(G, J)$ with the analogous algebra of the maximal torus of G (at least if J is hyperspecial). This is joint work with (various subsets of) Ollivier, Pépin, and Stockton.

Nov 27 (Thursday)

Title: On the schematic and analytic constructions of the local Langlands category
Speaker: Ian Gleason
Abstract: I will report on my upcoming collaboration with Linus Hamann, Alexander B. Ivanov, João Lourenço and Konrad Zou. In this project we compare two constructions of the automorphic side of the categorical Langlands correspondence. On one side of the comparison is the category $D_{\text{ét}}(\text{Bun } G)$ considered by Fargues–Scholze, on the other side is the category $\text{Shv}(B(G))$ considered by Zhu. We 1) outline the construction of the functor and 2) explain the overall strategy to show that it is an equivalence. Both 1) and 2) depend on geometric results due to G., I. and Zillinger.

Title: Towards a proof of the categorical local Langlands correspondence
Speaker: Lucas Mann
Abstract: The local Langlands correspondence aims to provide a natural bijection between certain sets of smooth representations of reductive groups on the one hand and Galois representations on the other hand. Fargues–Scholze's seminal work on the geometrization of the local Langlands correspondence has enabled a new access to the correspondence and in particular upgrades it conjecturally to an equivalence of categories, with ample applications to arithmetic geometry

and representation theory. In joint work with David Hansen we leverage classical results on the local Langlands correspondence in order to prove the categorical correspondence for GL_n and potentially all classical groups – conditional on a yet unproven compatibility of Fargues–Scholze's construction with parabolic induction, which is work in progress in a different project. Along the way we derive new results on ind-coherent sheaves on the stack of L-parameters and on ind-coherent sheaves on algebraic stacks in general.

Title: Transferring intersection number identities to characteristic p
Speaker: Andreas Mihatsch
Abstract: The last few years saw proofs of several new intersection number identities such as the arithmetic fundamental lemma of Wei Zhang, or the Kudla-Rapoport Conjecture proved by Chao Li and Wei Zhang. In my talk, I will present a general technique for transporting such identities from mixed to equal characteristic which is based on close fields. The main new objects are profinite families of moduli spaces of formal O-modules, where O interpolates between mixed and equal characteristic. Our main results state that intersection numbers in such families stabilize as one approaches characteristic p. This is joint work with Sebastian Bartling.

Title: Monoids, spaces and fundamental lemmas without induction
Speaker: Zhiyu Zhang
Abstract: Many things in representation theory and intersection theory naturally depend on the group rather than the Lie algebra. Monoids provide a new way of thinking and studying group theoretic questions, in particular multiplicative version Hitchin spaces, and a new proof of fundamental lemma in Langlands program. I will discuss new applications to relative Langlands program and arithmetic Higgs bundles, including a proof of (arithmetic) fundamental lemma without induction on the rank. This is based on joint works with G. Wang and Z. Yun.

Nov 28 (Friday)

Title: p-curvatures and non-abelian cohomology
Speaker: Josh Lam
Abstract: In a groundbreaking work in 1972, Katz proved that, if a Gauss-Manin differential equation has vanishing p-curvature for infinitely many p, then it has finite monodromy. In a joint work in progress with Daniel Litt, we prove a non-abelian version of this: precisely, if the p-curvature of a non-abelian Gauss-Manin differential equation (in the sense of Simpson) vanishes for infinitely many p, then the monodromy on integral points acts through a finite quotient. From this, we deduce many new cases of a conjecture of Ekedahl–Shepherd-Barron–Taylor and Bost. I will try to explain some ingredients in the proof, including some properties of non-abelian de Rham cohomology, both in characteristic zero and p, as well as a non-abelian Hodge index theorem.

Title: p-adic Fourier theory in families
Speaker: Pol van Hoften
Abstract: In this talk I will discuss Fourier a theory for p-divisible rigid analytic groups H in the sense of Fargues. This theory describes their spaces of global functions in terms of certain overconvergent functions on the dual of the p-adic Tate module of H. As an application, I hope to describe the Fourier transform of the modified Weierstrass p function as a function on the universal p-divisible rigid analytic group over the modular curve. This is joint work with Andrew Graham and Sean Howe.

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