

# One Day Workshop on p-adic Non-abelian Hodge Theory

## 8:30-9:30 Yupeng Wang

**Title:** On integral p-adic Simpson correspondence for small representations

**Abstract:** Fix a complete algebraic closed extension  $C$  of  $\mathbb{Q}_p$ . Let  $\mathfrak{X}$  be a smooth formal scheme over  $\mathcal{O}_C$  with rigid generic fiber  $X$ . Assuming  $\mathfrak{X}$  admits a lifting over  $A_{inf}$ , I will explain the following integral p-adic Simpson correspondence: There exists an equivalence between the category of small  $\hat{\mathcal{O}}_X^+$ -representations  $L$  on  $X_{pro\acute{e}t}$  and the category of small Higgs bundles  $(H, \theta_H)$  on  $X_{\acute{e}t}$  such that for corresponding  $L$  and  $(H, \theta_H)$ , there exists a morphism  $HIG(\mathcal{H}, \theta_{\mathcal{H}}) \rightarrow Rv_*\mathcal{L}$  with bounded cofiber, where  $v : X_{pro\acute{e}t} \rightarrow X_{\acute{e}t}$ . This is a joint work with Yu Min.

## 9:45-10:45 Ben Heuer

**Title:** A p-adic Simpson functor for proper varieties via moduli spaces

**Abstract:** For a smooth proper variety  $X$  over  $C_p$ , I will discuss a new construction of a p-adic Simpson functor from continuous representations of the étale fundamental group of  $X$  into the category of Higgs bundles on  $X$ . The construction relies on the study of moduli spaces of certain invertible sheaves related to spectral varieties.

## 11:00-12:00 Yixiao Li

**Title:** p-adic Riemann-Hilbert for Zariski-constructible sheaves over rigid analytic varieties

**Abstract:** Let  $k$  be a finite extension of  $\mathbb{Q}_p$ . The Riemann-Hilbert functor for p-adic étale local systems over rigid analytic varieties over  $k$  has been constructed by Liu-Zhu. There is a modification of this construction which works for Zariski constructible sheaves, as indicated by Bhatt-Lurie in the case of algebraic varieties. In this talk, we construct the Riemann-Hilbert functor for p-adic Zariski constructible sheaves, show its basic properties, and prove the coherence results.

## 2:00-3:00 Mao Sheng

**Title:** A solution to the Sun-Yang-Zuo conjecture

**Abstract:** Fix four distinct points  $\$D\$$  in the projective line over  $\mathbb{F}_p$ . Sun-Yang-Zuo studied the self-map on the moduli space of rank two graded logarithmic Higgs bundles of type  $\mathcal{O} \rightarrow \mathcal{O}(-1) \otimes \Omega(D)$ , via their theory of twisted Higgs-de Rham flows. They conjectured that the self-map is covered by the multiplication map by  $\$p\$$  on the elliptic curve, which is the double cover of the projective line branched along  $\$D\$$ . In this talk, I shall report our recent solution to this beautiful conjecture. Time permitted, I shall talk on recent progress on a generalization of Sun-Yang-Zuo conjecture, namely those graded logarithmic Higgs bundles  $\mathcal{O} \rightarrow \mathcal{O}(-g) \otimes \Omega(2g+2)$  over  $\mathbb{P}^1$ . These are joint works with Xiaojin Lin and Jianping Wang.

### 3:15-4:15 Hui Gao

**Title:** p-adic Hodge theory over the Kummer tower

**Abstract:** Using a non-abelian (indeed, non-Galois) Kummer tower, one can define Breuil-Kisin modules and  $(\phi, \tau)$ -modules. I will explain some of their applications in non-abelian (and non-commutative) p-adic Hodge theory.

### 4:30-5:30 Daxin Xu

**Title:** Parallel transport for Higgs bundles over p-adic curves

**Abstract:** Faltings conjectured that under the p-adic Simpson correspondence, finite dimensional p-adic representations of the geometric étale fundamental group of a smooth proper p-adic curve  $X$  are equivalent to semi-stable Higgs bundles of degree zero over  $X$ . We will talk about an equivalence between these representations and Higgs bundles whose underlying vector bundle admits potentially a strongly semi-stable reduction of degree zero. These Higgs bundles are semi-stable of degree zero and we will investigate some evidence for Faltings' conjecture.