1. Suggested References

The primary reference for this seminar will be Hong’s p-adic Hodge theory notes.

2. Order of Talks

(1) Finite flat group schemes, Frobenius. - Recollections on group schemes, in particular algebraic groups and elliptic curves, basic theory, and Frobenii. This should cover roughly section 1 of Hong.

(2) p-divisible groups. - This talk will introduce p-divisible groups, basic properties, and connections to Dieudonné modules, following section 2, chp 2 of Hong.

(3) Hodge–Tate Decomposition I. - The first of two talks introducing the Hodge-Tate decomposition, motivated from complex geometry, following roughly Hong II.3.1-II.3.3, focused on introducing formal groups and the p-adic logarithm.

(4) Hodge–Tate Decomposition II. - Continuing last weeks talk, this week we will finish section II.3 of Hong’s notes, discussing the Hodge–Tate decomposition for Tate modules, and generic fibers of p-divisible groups.

(5) Fontaine’s Formalism and Period Rings. - This talk introduces period rings, Fontaine’s resolution to Grothendieck’s conjecture about the Grothendieck mysterious functor, following section III.1 of Hong.

(6) de Rham representations. - Following Hong III.2, we introduce de Rham representations, the first kind of representations related to period rings which we will be interested in.

(7) Crystalline representations. This week, we discuss so-called crystalline representations and finish the discussion of Grothendieck’s conjecture, roughly following Hong III.3.

(8) Geometric structure of the Fargues–Fontaine curve. We turn our attention to the Fargues-Fontaine curve again, discussing its geometric properties as in Hong IV.2.

(9) Vector bundles on the Fargues–Fontaine curve I. - Following Hong IV.3.1-IV.3.4, we introduce the theory of vector bundles on the Fargues-Fontaine curve, one of the main tools in modern p-adic Hodge theory.

(10) Vector bundles on the Fargues–Fontaine curve II: Applications. In the final talk, we conclude the discussion on the properties of vector bundles on the Fargues-Fontaine curve, and connect them back to p-adic representations to give various applications, following Hong IV.3.5-IV.4.2.

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