

On p -adic Langlands program and geometry

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Let l and p be two prime numbers. The Langlands program aims to establish a bijection with good properties between l -adic representations of absolute Galois groups of number fields (respectively, p -adic local fields; this is the local case) and l -adic representations attached to automorphic representations of reductive groups over number fields (respectively, certain smooth l -adic representations of reductive groups over p -adic fields). This domain of research has seen a spectacular progress during last two decades culminating in establishing the existence of the desired correspondence for GL_n , when $l \neq p$ (work of Harris and Taylor).

The p -adic local Langlands correspondence focuses on the local case when $l = p$. This turns out to be much harder than the $l \neq p$ case and demands different technical tools. As for now, the p -adic correspondence is known only in the case of $GL_2(\mathbf{Q}_p)$ (by works of Berger, Breuil, Colmez, Emerton, Kisin, Paskunas and many others). There is a growing interest in generalizing this correspondence to other groups, especially because of many potential number-theoretic applications.

In our talk, we shall review recent progress in this theory, together with the latest technical input: completed cohomology of Emerton and perfectoid spaces of Scholze.