CONTEMPORARY NUMBER THEORY WORKSHOP

	27 Dec	28 Dec
1000-1200		discussion
1300-1350	Hong	
1400-1450	Booker	
1500-1530	coffee break	
1530-1620	Lee	
1630-1720	Jung	

Andrew R. Booker. (University of Bristol)
Title: Two results on Artin representations
Abstract: In 1923, Artin posed a conjecture about the finite-dimensional complex representations of Galois groups of number fields (now called Artin representations). This conjecture, most cases of which are still open, is one of the main motivating problems behind the Langlands programme. After a brief introduction to these topics, I will discuss two recent related results. The first, joint with Min Lee and Andreas Strmbergsson, is a classification of the 2-dimensional Artin representations of small conductor, based on some new explicit versions of the Selberg trace formula. The second extends theorems of Sarnak and Brumley to the effect that certain modular forms with algebraic Fourier coefficients must be associated to Artin representations.

Hong Serin. (University of Michigan)
Title: Extensions of vector bundles on the Fargues-Fontaine curve
Abstract: Vector bundles on the Fargues-Fontaine curve play a pivotal role in recent development of p-adic Hodge theory, as they provide geometric interpretations of many constructions in the field. The most striking example is the geometrization of the local Langlands correspondence due to Fargues where the correspondence is stated in terms of certain sheaves on the stack of vector bundles on the Fargues-Fontaine curve.

In this talk, we give a complete classification of extensions between semi-stable vector bundles on the Fargues-Fontaine curve in terms of a simple condition on Harder-Narasimhan polygons. We also explain how such a classification leads to a complete description of connected components of the stack of vector bundles on the Fargues-Fontaine curve, which is crucial for understanding the geometrization of the locan Langlands correspondence. The key ingredient of our proof is Scholze's language of diamonds, which allows us to define and study various moduli spaces of bundle maps. This is joint work with C. Birkbeck, T. Feng, D. Hansen, Q. Li, A. Wang and L. Ye.

Jung Junehyuk. (Texas A&M University)
Title: Distribution of Hecke eigenvalues: large discrepancy
Abstract: Vertical Sato-Tate theorem for holomorphic modular forms concerns the distribution of eigenvalues of a fixed Hecke operator T_p acting on the space of weight k and level N modular forms, as $k + N \to \infty$. It was proven by Serre (and independently by Sarnak) that there exists a limiting measure μ_p, which depends only on p, such that the eigenvalues become equidistributed relatively to μ_p.

Fix N for simplicity. Then this can be restated in terms of the discrepancy between two measures: a probability measure $\mu_{p,k}$ supported on the eigenvalues of the Hecke operator, and μ_p, i.e., it is equivalent to $D(\mu_{p,k}, \mu_p) \to 0$. Regarding the rate of convergence, in the context of arithmetic quantum chaos, it was suggested both by speculation and numerical test that

$$D(\mu_{p,k}, \mu_p) = O(k^{-1/2+\epsilon}).$$

In this talk, I'm going to disprove this by showing that

$$D(\mu_{p,k}, \mu_p) = \Omega(k^{-1/3} \log^2 k).$$

This is a joint work with Naser Talebizadeh Sardari and Simon Marshall.

Lee Min. (University of Bristol)

Title: Effective equidistribution of rational points on certain expanding horospheres

Abstract: The main purpose of this talk is to provide an effective version of a result due to Einsiedler, Mozes, Shah and Shapira, on the equidistribution of rational points on expanding horospheres in the space of unimodular lattices in at least 3 dimensions. Their proof uses techniques from homogeneous dynamics and relies in particular on measure-classification theorems due to Ratner. Instead, we pursue an alternative strategy based on spectral theory, Fourier analysis and Weil's bound for Kloosterman sums which yields an effective estimate on the rate of convergence in the space of $(d+1)$-dimensional Euclidean lattices with $d > 1$. This extends my work with J. Marklof, on the 3-dimensional case (2017). This is a joint work with D. El-Baz and B. Huang.