Valentin Blomer (University of Bonn)

Title: Density theorems and applications

Abstract: The generalized Ramanujan conjecture predicts that all cuspidal automorphic representations for GL(n) are tempered. A density theorem is a certain quantitative approximation towards the Ramanujan conjecture that in many cases serves as a good substitute. In this talk I will survey results, methods, and applications.

John Pardon (Stony Brook University)

Title: Derived moduli spaces of pseudo-holomorphic curves

Abstract: Moduli spaces of solutions to nonlinear elliptic pdes (anti-self-dual connections, monopoles, pseudo-holomorphic curves, etc.) are a fundamental tool in low-dimensional and symplectic topology. I will discuss foundational aspects of moduli spaces of pseudo-holomorphic curves, in particular how to construct their derived structure using moduli functors, as conjectured by Joyce. Key tools include derived manifolds, log smoothness, and stacks.

Laure Saint Raymond (IHES)

Title: What does entropy measure?

Abstract: Entropy is a key concept in many fields of physics and mathematics (statistical physics, information theory, dynamical systems): although it is always linked to a notion of complexity, it has a variety of definitions. The aim of this presentation is to understand what it can measure, close to equilibrium, in the process of relaxation towards equilibrium and far from equilibrium. A major issue is to know whether it can measure mixing properties.

Chenyang Xu (Princeton University)

Title: Kähler-Einstein metric, K-stability and moduli spaces

Abstract: A complex variety with a positive first Chern class is called a Fano variety. The question of whether a Fano variety has a Kähler-Einstein metric has been a major topic in complex geometry since the 1980s. In the last decade, algebraic geometry, or more specifically higher dimensional geometry has played a surprising role in advancing our understanding of this problem. In fact, the algebraic part of this question is one step of a larger project, namely constructing projective moduli spaces that parametrize Fano varieties satisfying the K-stability condition. The latter is exactly the algebraic characterization of the existence of a Kähler-Einstein metric. In the lecture, I will explain the main ideas behind the recent progress of the field.