Leibniz Universität Hannover

Oberseminar Analysis und Theoretische Physik

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BPS Partition Functions: Bridges between number theory, geometry and physics

Partition functions as utilized in physics are an important physical quantity to compute since these functions effectively inform us about the microscopic properties of the physical system. In fact, being able to compute quantum partition functions in gravity is one of, if not the biggest open problems in physics. Usually, it is not an easy task to derive a generating function for partitions in physics.

However, for certain kinds of "physical" Hilbert spaces (such as the space of BPS states) the generating functions of partitions are (usually, and for reasons yet to be fully understood) highly symmetric functions known as automorphic forms. These BPS partition functions are also of significant importance in algebraic geometry since they are closely related to partitions of certain enumerative invariants of Calabi-Yau manifolds. The study of these partitions has not only improved our understanding of non-perturbative phenomena in string theory/supersymmetric quantum field theory, but also led to important connections between number theory (mock modular forms, Harmonic Maaß forms, quantum modular forms), geometry (topological invariants of 3-manifolds, enumerative invariants of Calabi-Yau manifolds) and physics (quantum black holes, vertex operator algebras).

To formally state and go over all the connections and details will require more than an hour, so I will aim to provide only a general and gentle introduction of this research interface to an audience of mathematicians and physicists.

Dienstag, 24.05.2022, 15:00 Uhr, Raum c311 Hauptgebäude der Leibniz Universität

Dazu laden herzlich ein:

Prof. Dr. Wolfram Bauer, Prof. Dr. Joachim Escher, Prof. Dr. Johannes Lankeit, Prof. Dr. Elmar Schrohe, Prof. Dr. Christoph Walker