SIMC welcomes postdocs-2021

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Organizers

Steklov Mathematical Institute of Russian Academy of Sciences, Moscow

Steklov International Mathematical Center, Moscow

Denis Gorodkov. Combinatorial computation of characteristic classes

Consider a triangulated smooth manifold. Characteristic classes are invariants of fiber bundles that are some special base cohomology elements. They can be used to partially classify fiber bundles and manifolds. Then a naturally arising question is the following: is there a "reasonable" algorithm to compute characteristic classes of the manifold tangent bundle using exclusively the combinatorial data arising from the triangulation? The aim of the talk is to present some known answers and an arising application, as well as discuss further problems in the area.

Giridhar Kulkarni. Quantum inverse scattering method

Quantum spin chains are examples of one-dimensional quantum integrable models where the algebraic framework responsible for integrability also provides a viable approach for an exact computation of its correlation functions and form factors. Quantum inverse scattering method first introduced by Faddeev, Sklyanin and Taktajan is a prime example of this technique that has led to, at first the determinant representations for correlation functions and form factors of the Heisenberg's isotropic and anisotropic XXZ quantum spin chains, while their asymptotic analysis has further given exact results in thermodynamic limit in more specific cases. In this talk I will introduce the quantum inverse scattering method and discuss some of the results obtained using it. I will also try to present the challenges facing us in extending this approach to compute correlation or form factors in fully anisotropic XYZ quantum spin chain.

Mentzelos Melistas. A divisibility result related to the BSD Conjecture

The Birch and Swinnerton-Dyer (BSD) conjecture asserts that the size of the group of rational points of an elliptic curve, as well as several other invariants, are related to the behavior of an associated analytic object, the L-function of the curve. After discussing the BSD conjecture for elliptic curves over the rationals, we will focus on the analytic rank zero case and discuss a conjecture of Agashe, which is a consequence of the BSD. Finally, we will present a theorem that proves Agashe's conjecture.

Andrey Soldatenkov. Cohomology of compact hyperkähler manifolds

Compact hyperkähler manifolds naturally appear in the classification of complex algebraic varieties with trivial canonical bundle. Their geometry is to a large extent determined by the properties of their cohomology algebra. I

will try to present some ideas that are important for the study of hyperkähler manifolds, focusing on the natural Lie algebra action on their cohomology. More specifically, I would like to discuss how this Lie algebra action helps us to understand degenerations of hyperkähler manifolds.

Wenhao Wang. On finitely generated left-orderable metabelian groups

A group is left-orderable if it can be equipped with a total order that is invariant under left-multiplication. Such a left-order is computable if there exists an algorithm deciding the order of any given pairs of group elements. The computability problem for left-orders has gained interest in recently years. One of the numerous results is Darbinyan's work on the existence of a solvable group of derived length 3 such that it is left-orderable and has decidable word problem but none of its left-order is computable. On the contrary, Solomon has shown that for free abelian groups, there always exists a computable order. This talk will focus on an ongoing work on the topic of computability of left-orders for metabelian groups.