Kolleg Mathematik Physik Berlin

Interdisciplinary Center for Research in Mathematical Physics

KMPB – Day

July 14th, 2020

Zoom: `https://hu-berlin.zoom.us/j/94561679767`

10 am L_∞-Algebras and Field Theory

Olaf Hohm, Humboldt University, Berlin

L_∞-algebras are generalizations of Lie algebras in which the Jacobi identity can be violated in a way that is controlled by a differential and higher brackets. In turn, these brackets satisfy higher Jacobi identities. I explain how the data of a (classical) field theory can be encoded in an L_∞-algebra, with the familiar consistency conditions such as gauge invariance, covariance of the field equations, etc., being encoded in the L_∞-relations. The dictionary between L_∞-algebras and field theories allows for a purely algebraic interpretation of certain concepts in field theory, as will be illustrated with examples.

11 am Perturbative Quantum Field Theory and Scattering Amplitudes

Christian Sämann, Heriot-Watt University, Edinburgh

We review the homotopy algebraic perspective on perturbative quantum field theory: classical field theories correspond to homotopy algebras such as A_∞- and L_∞-algebras. Furthermore, their scattering amplitudes are encoded in minimal models of these homotopy algebras at tree level and their quantum relatives at loop level. We explain how the computation of the minimal model reproduces the Feynman diagram expansion. We close with some applications of our formalism.

2 pm Homotopy Algebras and Double Copy

Hyungrok Kim, Heriot–Watt University, Edinburgh

A class of relations, known as double copy, relates amplitudes of different field theories (e.g. Yang–Mills to gravity; sigma models to galileons), originally inspired by string-theoretic open–closed duality. Perturbative field theory (and string field theory) can be naturally formulated in the framework of homotopy-theoretic generalisations of well known algebraic structures, such as L_∞- and A_∞-algebras (generalising Lie algebras and associative algebras). I will discuss recent work about how these algebras provide a natural framework to algebraically formulate these double-copy relations.

Contact: Sylvia Richter, `sylvia.richter@physik.hu-berlin.de`