Julius-Maximilians-
UNIVERSITÄT
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MUΦX
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Announcement

Seminar on Deformation Quantization

17. 12. 2021 at 2pm CET

Hybrid Seminar in SE 30 and

`https://uni-wuerzburg.zoom.us/j/92529190594?pwd=WkJvR1o1QUdldUNSSjFJbHB4c0Z0dz09`

Thomas Weber (Università del Piemonte Orientale)

The Hopf Algebra of Christmas Trees and Renormalization of Quantum Field Theory

Christmas trees are one of our favourite aspects of the holidays. Over the centuries, many empirical sciences attempted to understand the phenomenon of those pleasurable plants. While legions of biologists failed, it were as usual the mathematicians who saved the day by uncovering the true nature of Christmas trees. In this talk we consider Christmas trees as mathematical objects and observe that they form a forest, which is endowed with the rich structure of a Hopf algebra, i.e. the quantum analogon of a group. Its multiplication turns out to be commutative, while the coproduct, given by all possible ways to cut down a tree, is not. As an application, we briefly discuss that Christmas trees correspond to divergent integrals in quantum field theory and show how Hopf algebra techniques can be used to renormalize certain divergences. While Christmas trees have been suspected to solve the problem of UV-divergence for quite a while, it were Connes and Kreimer who found this interesting connection.

Invited by Stefan Waldmann