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Scalar-scaffolded Yang-Mills amplitudes: minimal basis, a planar expansion and derivatives

Wednesday 5 November 2025 14:00 (40 minutes)

The scaffolding description of Yang-Mills amplitudes via the planar variables originally introduced in the curve integral formalism, naturally captures the planar structure of color-ordered gluon amplitudes and offers a unique expression at fixed multiplicity. In this talk, we study the derivatives of tree-level Yang-Mills amplitudes with respect to these variables and derive a systematic rule for constructing differential operators that generate individual scalar cubic diagrams. Interestingly, in some cases, straightforward generalizations of these operators yield results that incorporate gluon insertions, although in certain instances the naive generalizations fail. We also show that the number of linearly independent mixed amplitudes of r scalars and $n-r$ gluons is given by the Catalan number $\mathcal{C}_{r-2}$. This leads to a planar version of the universal expansion of Yang-Mills amplitudes.

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